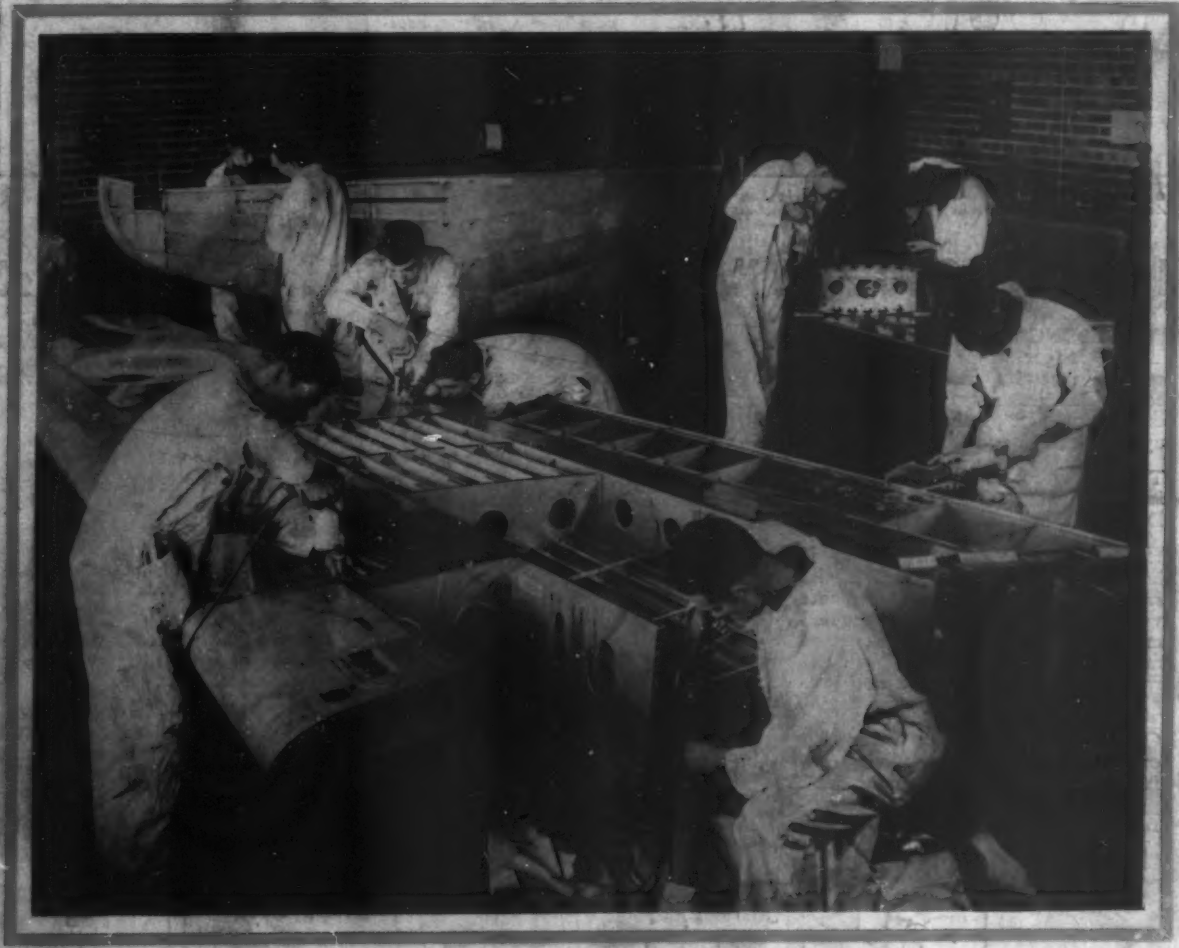
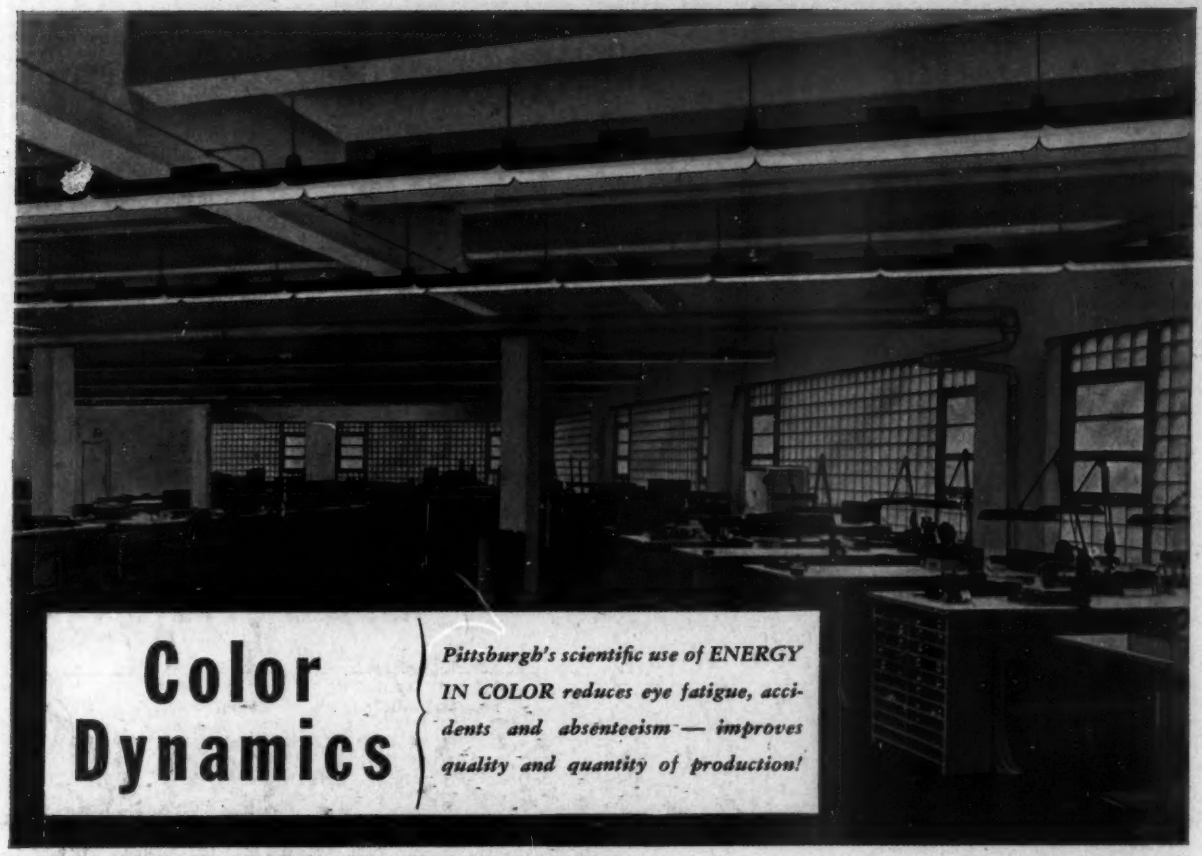
February, 1946 Vol. 35, No. 2

PUBLIC LIBRARY
JAN 22 1946
TROIT

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION



Pre-Convention Number



Color Dynamics

Pittsburgh's scientific use of ENERGY IN COLOR reduces eye fatigue, accidents and absenteeism — improves quality and quantity of production!

• *COLOR DYNAMICS aids precision workers in Long Island Plant of DeJur-Amsco Mfg. Co., makers of cameras, projectors and electrical indicating devices*

Include COLOR DYNAMICS in Your Training Courses!

TRAINING of skilled shopmen is no longer confined merely to courses in metal, machinery and methods. It includes study of the influence of physical and psychological factors upon workmen and their output.

That's why so many educators now include Pittsburgh's science of COLOR DYNAMICS in their curricula.

This new method of painting is based upon human reactions to the *energy in color*. In hundreds of plants where its principles have been applied more work per man-hour and more man-hours per man have been the result. Both management and employees are unanimous in its praise.

COLOR DYNAMICS requires that every color used on walls, floors, ceilings, machines and mobile equipment perform definite duties. Focal and eye-rest colors lessen eye fatigue which often leads to physical fatigue and absenteeism. Morale-building colors restrain mental depression. Safety colors warn of impending danger.

If you want your students to be equipped thoroughly for their future jobs, begin now to teach COLOR DYNAMICS in your school. Better still—demonstrate its principles in a practical manner. Apply them in the decoration of your school shop, ceilings, walls, floors, machines and equipment—and see the difference!

• • •

Write today for a free copy of our book, *"Color Dynamics."* It contains a full explanation of these new principles and how they should be used. Address Pittsburgh Plate Glass Company, Paint Division, Dept. IV-2, Pittsburgh 22, Pa.

Paint RIGHT with Color Dynamics
Paint BEST with Pittsburgh Paints!

Make the benefits of COLOR DYNAMICS last longer by using Pittsburgh Paints. You'll find one for every need!

WALLHIDE—in three types. **PBX**—extra durable finish which can be washed without streaking or spotting. **SEMI-GLOSS**—for higher sheen. **FLAT**—velvet-like finish for offices, suites and dining room. These paints are enriched with *"Vitolized Oils"* for live-paint protection!

FLORHIDE—for floor surfaces. Quick drying, tough, can be scrubbed frequently with soap solutions.

LAVAX PBX ENAMEL—for woodwork, furniture, metal trim—its china-like gloss resists marring and abrasion.

LAVAX MACHINERY ENAMEL—tough, durable and impervious to oil, grease, grime or dirt.

PPG **PITTSBURGH PAINTS**

PITTSBURGH PLATE GLASS COMPANY, PITTSBURGH, PA.

PITTSBURGH STANDS FOR QUALITY PAINT AND GLASS

Back to Training FOR INDUSTRIAL TRADE CAREERS

A. V. A. CONVENTION

See the factory display of South Bend Lathes during the Convention of The American Vocational Association, Statler Hotel, Exhibition Hall, Booth No. 49, February 6 to 9 inclusive.

Servicemen are returning to civilian life in ever increasing numbers. Thousands of these veterans need vocational training to fit them for their first jobs in private industry. Others need "refresher" courses and instruction to bring them up to date after absences during which industry has made rapid wartime advances. To schools and apprentice training shops, this means abnormally heavy enrollments during the coming months.

School shops equipped with South Bend Precision Lathes offer trainees the definite advantage of learning to use the lathes which industry chooses for its own exacting needs. The qualities for which these lathes are famous—precision, versatility, ease of operation, rugged construction, dependability—make them logical, practical lathes for instruction purposes, too. Write today for illustrated Catalog 100-D which contains specifications.

SOUTH BEND LATHES

Get These Instructive Books FREE!

Sample copies of these valuable instruction and study aids will be sent without charge to school shop and vocational instructors upon request. Additional copies 10c each. Ask for book No. 36-A, "How to Cut Screw Threads" and No. 35, "How to Grind Lathe Tool Cutter Bits."

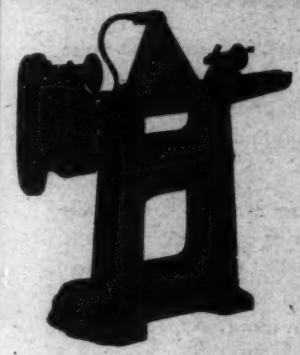
SOUTH BEND LATHES USED IN CENTRAL HIGH SCHOOL, NEWARK, N. J.

SOUTH BEND LATHE WORKS

466 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

WALLACE
"MACHINE-OF-THE-MONTH"



No. 46 LATHE

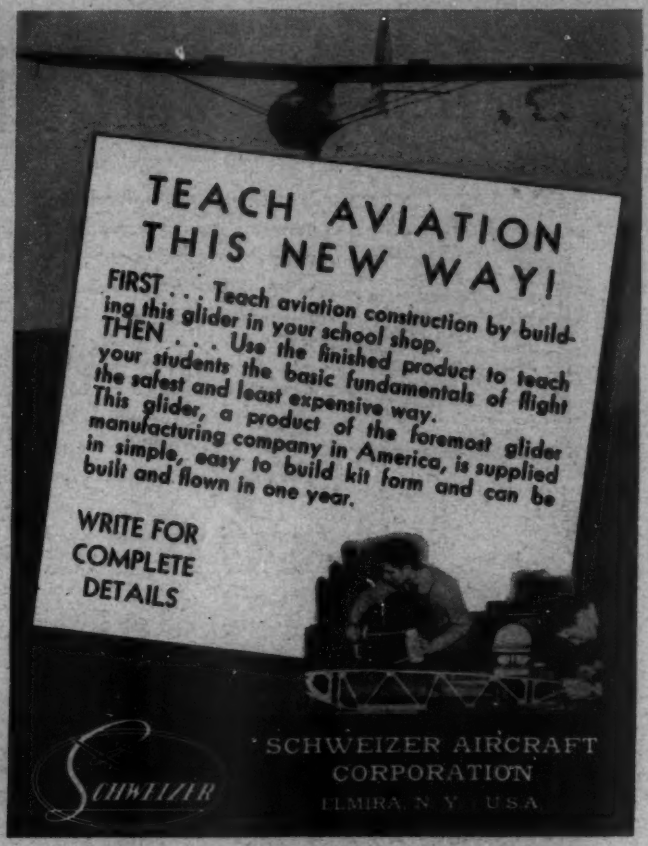
Nine variable speeds from 550 to 2400 r.p.m. Automatic - tensioning belt drive. Hardened steel spindle with taper-roller bearings for end thrust. Swiveling headstock for face plate work to 30" diameter.

Here is a lathe equipment of which you can be proud! Sturdy design, precision machining, insures accurate and trouble-free operation. The variable speed drive and heavy-duty headstock invite its use for metal-spinning as well as wood turning.

Swivelling headstock gives unlimited capacity for face plate and center turning work.

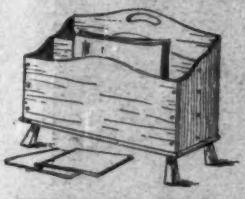
Write today for bulletins and prices—we also manufacture quality Universal Saws, Cut-off Saws, Bandsaws, Jointers, Mortisers, Shapers, Oilstone Grinders, etc.

J. D. WALLACE & COMPANY
140 S. CALIFORNIA AVE. CHICAGO, ILL.


TEACH AVIATION THIS NEW WAY!
FIRST . . . Teach aviation construction by building this glider in your school shop.
THEN . . . Use the finished product to teach your students the basic fundamentals of flight the safest and least expensive way.
This glider, a product of the foremost glider manufacturing company in America, is supplied in simple, easy to build kit form and can be built and flown in one year.
WRITE FOR COMPLETE DETAILS
SCHWEIZER AIRCRAFT CORPORATION
ELMIRA N Y U S A

New PROJECT PLAN Sets

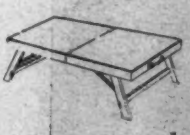
Just Out – 5 Practical and Useful Plan Sets Are Added to Stanley's Popular Shop Project Material – Each New Set Includes 5 Different Projects – at Only 10c a Set!



No. 15 – *Small Colonial Furniture:* Bench, Magazine Stands of 3 different types – Book and Cigarette Stand.

No. 16 – *Children's Toys:* Toy Wagon – Kiddie Push Car – Toy Wheelbarrow – Rocking Horse – Scooter.

No. 19 – *Chests, Racks, Rocker:* Dressing Glass – Child's Rocker – Bedside Chest – Unique Sewing Kit – Portable Towel Rack.



No. 17 – *Folding Tables and Trays:* Picnic Case and Table – Folding Snack Table – Combination Tray – Collapsible Bed Tray – Match Box Holder.

No. 18 – *Tables and Stands:* Revolving Book Stand and Table – Folding Card Table – Nest of Plain Tables – Nest of Colonial Tables – Folding Coffee Table.

14 OTHER POPULAR PLAN SETS ARE AVAILABLE

STANLEY
THE TOOL BOX OF THE WORLD

MAIL COUPON TODAY
10c A SET POSTPAID

Stanley Tools, Educational Dept., 1A-346 Elm Street, New Britain, Conn. Enclosed is ($.) – 10c for each set according to numbers checked below – postpaid.

15 ( ) 16 ( ) 17 ( ) 18 ( ) 19 ( )

Name .....
Title .....
School Name .....
City ..... State .....

Available again—
Mimeograph duplicators

COPYRIGHT, A. B. DICK COMPANY

MIMEOGRAPH is the trade-mark of A. B. Dick Company, Chicago, registered in the U. S. Patent Office. A. B. DICK COMPANY, Chicago. The Mimeograph Company, Ltd., Toronto.

She (or he) will practice what you Teach . . .

Photo Courtesy Douglas Aircraft Company

If You Standardize on KESTER Solders

There are two reasons why technical and vocational schools get better results teaching soldering the Kester way.

Reason 1 Soldering with Kester Flux-Filled Solder—is easily taught—quickly learned! The pure alloy with self-contained flux in just the right proportion is applied in one simple, virtually mistake-proof operation. No mussy separate flux to waste, spot benches or mar shop floors.

Reason 2 Kester Flux-Filled Solders are Standard for Industry, because they give permanent results, standing up under the expansion and contraction of temperature extremes, as well as shock, vibration, twisting and bending.

Thus, when you teach soldering the Kester Way, you impart to your students a practical skill they will find valuable later, "on the job," in making home repairs, or pursuing hobbies. Use Kester Rosin-Core Solder for electrical work, and Kester Acid-Core Solder for general work.

Order from your wholesaler.

KESTER SOLDER COMPANY

4257 Wrightwood Avenue, Chicago 39, Illinois
Eastern Plant, Newark, N. J. Canadian Plant, Brantford, Ont.

KESTER
FLUX-FILLED SOLDER

COLUMBIAN VISES

INDUSTRY'S FIRST CHOICE FOR OVER THIRTY YEARS

Columbian Continuous screw Woodworker's vises are furnished with hard wood handles—or may be equipped with ADJUSTABLE STEEL HANDLES, as above, to eliminate handle breakage, speed operation and provide extra leverage.

The complete line of Columbian Vises is designed to excel in its field—all are made to the same high standard of engineering and workmanship. A vise for every need and purpose.

Columbian Machinist's Vises are made of malleable iron castings, guaranteed unbreakable, and designed to provide accurate, dependable equipment for school and industrial shops. All standard types.

THE COLUMBIAN VISE & MFG. CO.
9022 BESSEMER AVENUE CLEVELAND 4, OHIO
THE WORLD'S LARGEST MAKERS OF VISES

INSTRUCTORS AND STUDENTS ALIKE ENJOY USING LUFKIN TEMPERED STEEL RULES

The accuracy and durability of Lufkin Tempered Steel Rules make them outstanding favorites with teachers and apprentices in school shop and bench work. Black, prominent markings on both sides are sunken—they can't wear out. Teach good workmanship with good tools—supply your students with Lufkin tools, the choice of industry. For free catalog, write THE LUFKIN RULE CO., SAGINAW, MICH., New York City.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION, February, 1946. Volume 36, No. 2. Published monthly, except during July and August, by The Bruce Publishing Co., Milwaukee 1, Wis. Entered January 2, 1914, as Second-Class Matter at Milwaukee 1, Wis., under Act of March 3, 1879. Subscriptions — U. S. and Canada, $2.50 per year. Foreign, $3.00; Single copies, 35 cents.

Black & Decker
7" Heavy-Duty Sander
$65
7" Standard $53

Do All This with One Tool

The Black & Decker Portable Electric Sander is more than a Sander! It's also a Grinder . . . a Wire Brusher . . . a Planer . . . a Surfacer. It drives a wide variety of attachments . . . teaches your students to do faster, better work on a tremendous variety of jobs.

With abrasive discs in 19 different grains, it sands and finishes any surface. With Wire Cup Brushes, it takes off old paint, rust and scale . . . cleans castings, tanks, boilers, vats, sheet metal and soldered joints. With saucer or cup-type grinding wheels, it removes metal . . . smooths welds and casting ridges . . . grinds off old rivets, studs and bolts . . . sharpens stationary machine blades. With rotary gouging and planing heads, it shapes and semi-finishes lumber, does work formerly done with jack plane and adz, faster, cleaner, more uniformly.

Exceptionally heavy demand still keeps the supply of these Sanders tight . . . so, to insure the earliest possible delivery, place your order with your Black & Decker Distributor now . . . they're worth waiting for. For our catalog—containing details on Black & Decker Sanders, Grinders, Drills, Saws and over 100 other Portable Electric Tools—write to: The Black & Decker Mfg. Co., 680 Pennsylvania Ave., Towson 4, Maryland.

Sands any Surface

Speeds Wire Brushing

Shapes All Timbers

Grinds any Metal

LEADING DISTRIBUTORS EVERYWHERE SELL

Black & Decker

PORTABLE ELECTRIC TOOLS

ARMSTRONG

TURRET LATHE AND SCREW MACHINE TOOLS

Today, America Needs TURRET LATHE and SCREW MACHINE OPERATORS

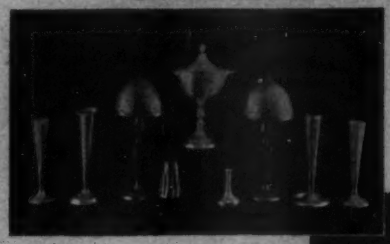
The transition from tooling-up to all-out production has increased the need for turret lathe and screw machine operators. When preparing your courses to help fill this need it would be well to build them around ARMSTRONG TURRET LATHE and SCREW MACHINE TOOLS. These are provided for the basic operations, and take standard drills and knurls or cutters that anyone can quickly grind from stock shapes of high speed steel. Permanent, multiple-purpose tools, they reduce tooling-up to the selection of cutters, adjustment for clearance and tightening of set screws.

Write for catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People" 322 N. Francisco Ave., Chicago, U. S. A.
Eastern Warehouse & Sales: 199 Lafayette St. New York

It's easy to spin

BEAUTIFUL, USEFUL VASES, TRAYS, ETC. ON THIS MODERN SPINNING LATHE



"Oliver" Metal Spinning Lathe

Easy for the instructor to teach . . . easy for the student to learn on this new lathe. It offers unlimited opportunities to produce lovely articles from copper, bronze, pewter, etc. A heavy bed, large bearings of finest quality, variable speed motor headstock enable you to spin metals as heavy as 20-gauge steel *with ease*. And you can't beat it for turning wood.

Write for illustrated folder.

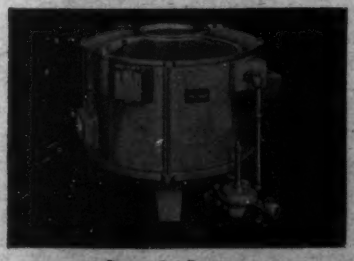
OLIVER MACHINERY COMPANY
GRAND RAPIDS (2) MICHIGAN

STEWART

THE BEST INDUSTRIAL FURNACES MADE

Small Semi-Muffle Oven

Small Forge



Round Pot Furnace

Melting Furnace

HUNDREDS OF THESE STEWART FURNACES ARE IN THE VOCATIONAL DEPARTMENTS OF TECHNICAL SCHOOLS

Because Stewart units have been designed for efficient production heat treating in small shops and tool rooms, they are widely recognized as standard equipment for all types of industrial heat treating and vocational training work. For student instruction and reference with further details on Stewart Furnaces especially suitable for school shop use, write for our free "STEWART HANDBOOK of Heat Treating Information and Equipment." Also the new Stewart DATA FILE on school units.

STEWART INDUSTRIAL FURNACE DIV. of CHICAGO FLEXIBLE SHAFT CO.
Main Office: 4433 Ogden Ave., Dept. 129, Chicago 23, Ill.
New York Office: 11 West 42nd St., New York 18, N. Y.

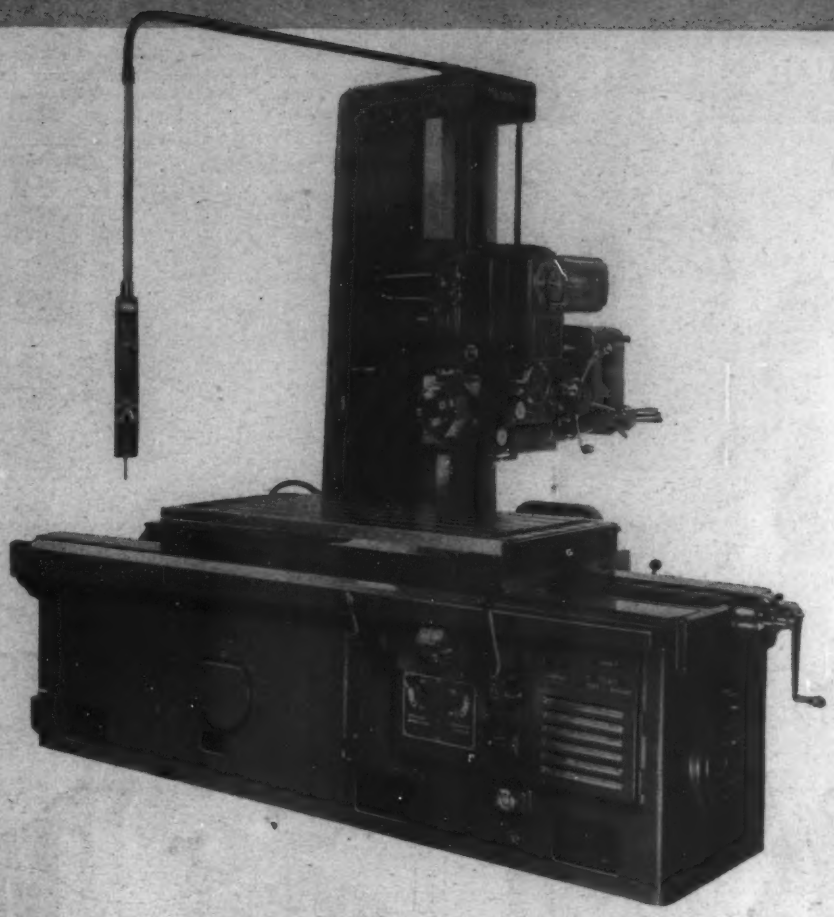
Bench Oven Furnace | Triple Purpose Combination "E" | Triple Purpose Combination "D" | Dual Combination

Announcing the **KEARNEY & TRECKER**

Milwaukee

Precision Milling and Boring Machine

No. 3 MODEL T



Precision Milling plus Precision Boring — performed in one setting of the workpiece — results in greater accuracy in the finished product. That is the contribution this machine offers to economical production of parts requiring precision milling and boring operations.

Developed by Kearney & Trecker engineers to provide a faster and more accurate method of highly precise milling and boring in one setup, the Kearney & Trecker Precision Milling and Boring Machine embodies these basic features:

- Precise machine alignments and measuring devices to assure highly accurate results.
- A wide range of speeds and feeds are available for the efficient use of modern cutting tools on a wide variety of operations.
- A No. 50 National Standard spindle nose that accommodates modern milling and boring tools.
- Centralized boring head controls, dual table controls and a swivel control pendant provide for easy and rapid operation.

Again Kearney & Trecker engineers have proven their skill in the design and proportioning of this machine tool. Constructed on the unit plan this machine is characterized by its rigidity — ease of operation — and precise results. Write for descriptive catalog No. T10.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC BORING MACHINES

Kearney & Trecker

Products

CORPORATION

MILWAUKEE 14, WISCONSIN

Subsidiary of Kearney & Trecker Corporation

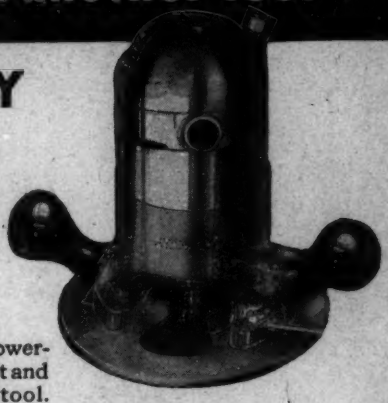
Books in the Milling Practice Series

Book One—"Right & Wrong in Milling Practice" — describing errors and correct practice in setup, operation and maintenance of milling machines, selection of cutters, etc.

"Methods of Cam Milling" — covers the special problems involved in the machining and milling of cams of various types and the use of the Rotary Table, Dividing Head, Rotary Head Milling Machine, etc.

Another bit ...another tool

STANLEY No. 10A ROUTER



It's a versatile power-tool. Change the bit and you change the tool. Add new bits as you need them. Here are just six of the many cuts you can make with this inexpensive tool.

BEADING for corner and edge beading.

CHAMFERING on mouldings table tops.

GROOVING and routing out background of carvings, panels and for strip inlays.

ROUNDING OFF edges of moulding and table tops.

COVING on panel rails and table-leaf cut on drop-leaf tables and for similar work.

"V" GROOVING on signs, plaques and other decorative work.

Write for Catolog 607, which explains and shows the work you can do with this efficient Stanley Tool.

MAIL THIS COUPON TODAY

STANLEY ELECTRIC TOOLS, Educational Dept. IA246
New Britain, Connecticut

GENTLEMEN: Please send free booklet describing the Stanley Router-Shaper.

Name .....

Subject You Teach .....

School .....

City and State .....

STANLEY

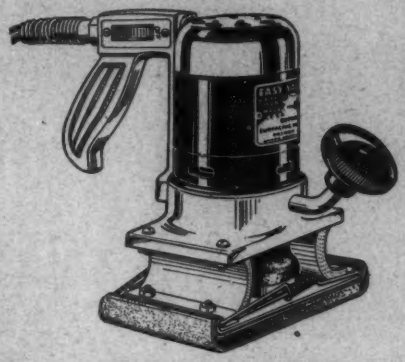
STANLEY ELECTRIC TOOLS

DOES THE JOB!

The EASY SANDER

Teach students with equipment they'll use on the job. The EASY Sander is extensively used in schools and industry. Sanding, rubbing polishing,, "feather-edging," and deburring. Wood, metal, plastic composition, and other materials.

1. — Plug in any light socket.
2. — Light weight.
3. — Simple operation.
4. — Foolproof.
5. — Action eliminates swirls or gouging.



6. — Superior finishes assured.
7. — Short stroke no dust.
8. — Resurfaces blackboards.

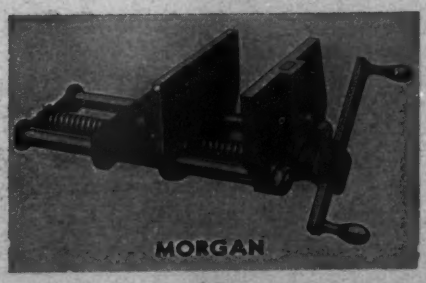
Designed and precision built of selected materials for maximum efficiency. Rugged 115 or 220 volt, powerful, universal electric motor. Operates from any A.C. or D.C. outlet. All moving parts mounted on ball bearings. Drive mechanism sealed and packed in grease. Forced, dust filtered cooling. Two comfortable handles. All insuring ease of operation, long life and trouble-free performance.

Write for Details and Prices

WOODWORKER'S TOOL WORKS

222-224 S. Jefferson St. Chicago 6, Illinois

SPEED-UP! MORGAN VISES



Morgan vises, the product of over thirty years experience in manufacturing better vises for machinists and woodworkers, are protected by an unqualified guarantee. Noted for their quick action and accurate, positive grip, they are the modern equipment for the modern shop.

Write for complete information and prices.

MORGAN VISE CO.

120 N. Jefferson Street Chicago, Illinois

A VALUABLE GUIDE IN PLANNING THE SCHOOL SHOP
GOOD POINTS TO REMEMBER IN CONSIDERING REQUISITIONS FOR SHOP EQUIPMENT
BASIC PRINCIPLES HELPFUL IN REVIEWING THE OVER-ALL STATUS OF SHOP PROGRAMS
HOW TO PLAN A SCHOOL WORKSHOP
THE DELTA MANUFACTURING CO. MILWAUKEE
PRICE $1.00

Free Shop Planning Help from Delta

In this practical handbook, "How to Plan a School Workshop," Delta shares with you its intimate working acquaintance with the particular requirements of school shops — authoritative knowledge gained through many years' association with the industrial arts field.

For example, this 44-page book provides you with photographs and layout drawings of 30 typical shops, for schools large and small. These are not fanciful shops "dreamed up" by Delta, but floor-plans of shops that have been actually built and proven practical in regular classroom use., They are the winners selected by impartial judges in a nation-wide shop-planning competition, from hundreds of plans submitted by vocational instructors.

This helpful book also serves you as a condensed guide to principles of shop planning . . . to the selection, placement, and efficient use of the major power tools.

Here is useful information that is of value to you — from the standpoint of economy, safety, convenience, teaching efficiency — regardless of the present stage of your postwar planning.

There's a free copy of "How to Plan a School Workshop" ready for mailing to you. Send for your copy today, to help you keep well-informed on planning and equipping the school shop. Use the coupon on the next page for convenience.

Delta
MILWAUKEE
Machine Tools

Turn the page

Sent free to you . . .

Catalog of low-cost Delta-Milwaukee Machine Tools

for metalworking and woodworking

Use coupon below

Delta 17" Drill Press (for metal, wood, or plastics)

Delta 14" Drill Press with production table

Delta Toolmaker* Surface Grinder

Delta Industrial Grinder with Safety Shields

In addition to machines illustrated, the complete line of Delta-Milwaukee Machine Tools includes:

• Delta Unisaw* (10" Tilting Arbor Circular Saw) • Delta 6" Jointer • Delta Abrasive Belt Finishing Machine • Delta Abrasive Disk Finishing Machine • Delta 4-speed Scroll Saw • Delta Heavy-Duty Shaper • Delta 12" Woodworking Lathe • Delta 14" Band Saw (wood-cutting or metal-cutting) • Delta Cut-Off Machine.

Certain tools are available to schools under automatic priorities (CMP Regulation 5a). Consult your Delta distributor.

Tear out coupon and mail today!

THE DELTA MANUFACTURING CO.
661B E. Vienna Ave., Milwaukee 1, Wisconsin

Please send me my free, personal copy of:

☐ "How to Plan a School Workshop."

☐ Catalog of low-cost Delta-Milwaukee Machine Tools.

Name.....

Position.....

Address.....

City.....(.....) State.....

8-20

WEBER

ARTIST and DRAWING MATERIALS

Quality Products for Vocational Courses in Art and Mechanical Drawing.

FOR MECHANICAL DRAWING:

Drawing Instruments
Drafting Supplies
Waterproof Drawing Ink

FOR ART AND COMMERCIAL ART:

Fine Artist Quality Colors in all mediums, and Related Products.

STUDIO SCHOOL AND DRAFTING ROOM FURNITURE

Catalog Vol. 700 to Teachers and Schools, on Request.

Manufactured by

F. WEBER CO.

Est. 1853

PHILADELPHIA 23, PA.

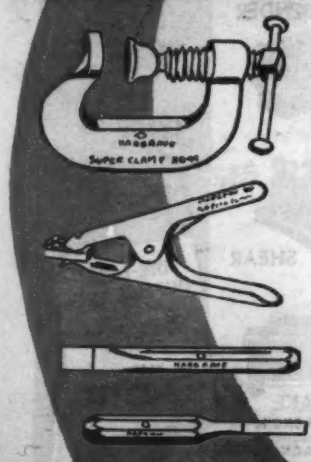
ST. LOUIS 1, MO. BALTIMORE 1, MD.

PATRONIZE YOUR NEAREST WEBER DEALER

H

HARGRAVE TESTED TOOLS

The Craftsman's Choice



In school or factory HARGRAVE Tested Tools are designed to help the craftsman do work better. HARGRAVE Clamps, Chisels and Punches are INDIVIDUALLY TESTED insuring longer life and superior performance. Made in a wide range of sizes and patterns.

WRITE FOR CATALOG showing the complete line of HARGRAVE Clamps, Chisels, Punches, Washer Cutters, File Cleaners, Brace Wrenches, etc.

There is an Industrial Distributor Stock Near You

Waverly & Main Aves.
CINCINNATI 12, OHIO

Ask Your Dealer

The CINCINNATI TOOL Co.

A Practical Tool for Practical Training

When you use Weldwood Glue for classroom work today, you put into your student's hands a "tool" of great practical value in a trade he'll enter tomorrow.

Quick and easy to use . . . stain-free and odorless . . . Weldwood Glue comes in fine powder form that mixes readily with ordinary cold tap-water to form a smooth, cold-spreading, cold-setting bonding agent that's tremendously strong and durable.

And it sets fast . . . so quickly that jobs can be handled . . . even light-worked . . . a few hours after clamping.

Available in hardware stores and lumber yards in 1⅛ oz., 3½ oz., 8 oz., 1 lb. and 5 lb. cans; and from your supply dealer in 10 and 25 lb. cans and 100 lb. drums.

For full information and sample, mail the coupon.

"Teach the boys today with the glue they'll use tomorrow"

WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE

UNITED STATES PLYWOOD CORPORATION
Industrial Adhesives Division, Dept. 244
55 West 44th Street, New York 18, N. Y.

Please send literature, prices and samples of Weldwood Glue:—

*Name*_____ *Position*_____

*School*_____

*Address*_____

*My Regular Source of Supply is*_____

Snap-on Tools
THE CHOICE OF BETTER MECHANICS
THE WORK HABITS of a lifetime are established during the formative training years! Speed, accuracy and confidence in the use of hand tools can only be developed with *modern tool equipment* . . . the type of tools that are used in top industrial plants for production, assembly and maintenance operations . . . *the only kind* a good mechanic will consider in making his own tool investments. To vocational schools everywhere Snap-on tool service is available through 38 factory branches. Write for catalog of the complete Snap-on line.
SNAP-ON TOOLS CORPORATION
8074-B 28th Avenue Kenosha, Wisconsin

It's Easier to Teach
Good Soldering With Rubyfluid
Soldering Flux

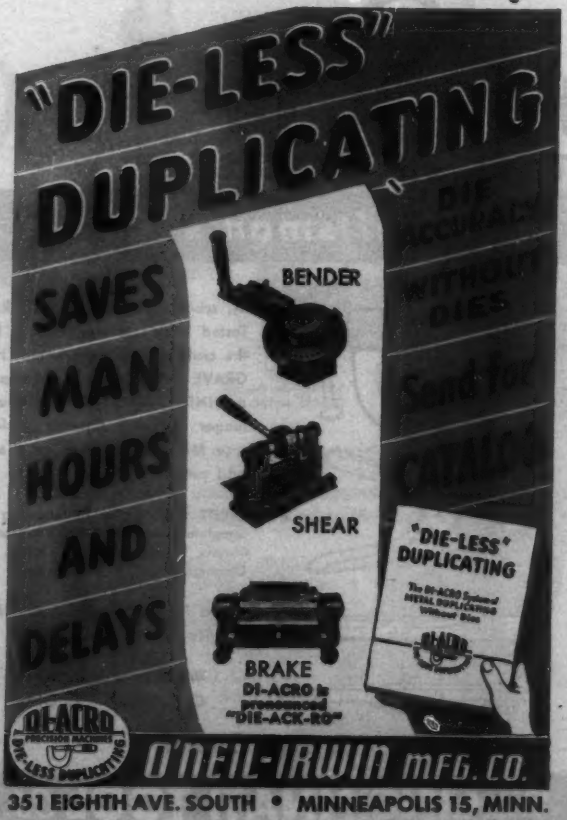
It's easier to teach soldering with a soldering flux that wets out freely and makes strong, neat unions, is fast and easy to use. Does not corrode metal. Has no harmful fumes.

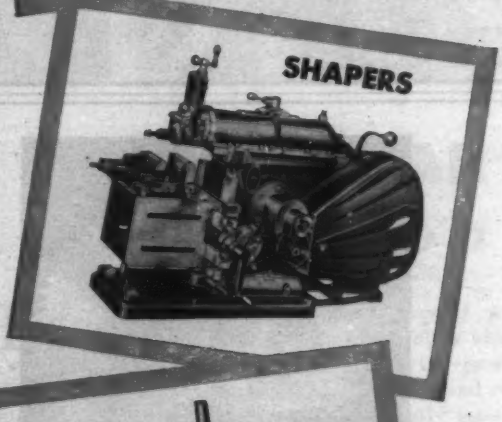
For Stainless Steel

Use Rubyfluid's special Stainless Steel Flux. Requires no special equipment or excessive heat. No discoloration of metal.

Ask Your Jobber or
Write Direct
THE RUBY CHEMICAL CO.
77 McDowell St. Columbus, Ohio

Rubyfluid





VALUABLE TEACHING AIDS

Atlas vocational material includes a complete lathe operation manual and a set of five large blue-print type wall charts. Send for full details.

Expand Your Shop Facilities at Low Cost with *Atlas* Tools

"The greatest good for the greatest number" has become a guiding axiom for many school shop equipment recommendations.

Students need more unhurried time on practical machine projects, today, if they are to get the most good from their training. All of us in vocational education must constantly keep in mind our responsibility to give each mechanically skilled student full opportunity to develop his talents.

Atlas tools are ideal for such a program. Their rugged construction for 'round the clock industrial production assures long life in your shop. Their low cost enables you to make the most of your equipment budget.

SEND FOR LATEST CATALOG

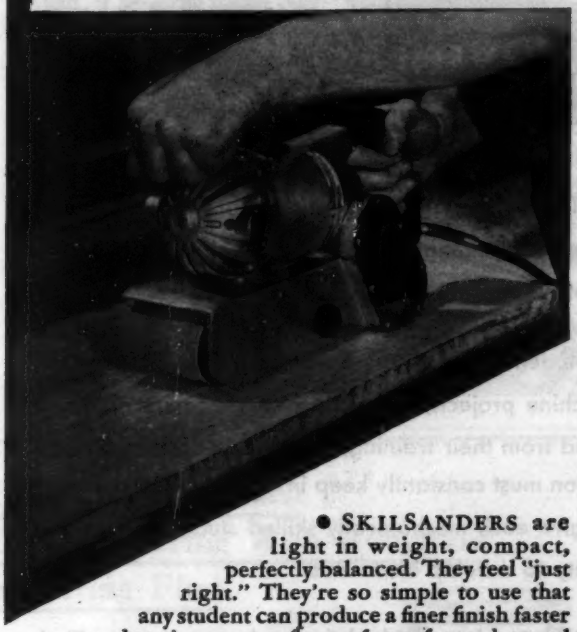
This 64 page, completely illustrated, catalog contains all the work range and tool specifications you'll need to consider Atlas tools in making up your new recommendations and requisitions. Send for your copy today.

ATLAS PRESS COMPANY

271 N. Pitcher St., KALAMAZOO 13, MICH.

IT'S EASIER TO TEACH BETTER SANDING with EASY-TO-HANDLE

SKILSANDERS!



● SKILSANDERS are light in weight, compact, perfectly balanced. They feel "just right." They're so simple to use that any student can produce a finer finish faster and easier on any flat surface of wood, metal or compositions.

And SKILSANDERS are rugged, dependable, quality-built throughout so they last longer and operate at lower cost . . . help you keep your budget in line.

Let your distributor show you on your own work why SKILSANDERS belong in your manual training shop. Phone him today for a demonstration.

SKILSANDERS are ideal for refinishing desks, blackboards and woodwork. They're preferred by industry everywhere for speed, economy and easy handling.

SKILSAW, INC.

5033-43 Elston Avenue • Chicago 30, Illinois

Factory Branches in All Principal Cities

PORTABLE ELECTRIC

SKILTOOLS

MADE BY SKILSAW, INC.

SAW FILING

This ONE Machine

automatically files and joints

HAND, BAND, CIRCULAR Saws

The Foley Saw Filer is ideal for sharpening saws used by students in school shops. It keeps them in tip-top shape, faster and better than by hand filing. Used by Army, Navy, hundreds of manual training departments and industrial plants. The Foley is the only machine that files and joints all hand, back and mitre box saws from 3 to 16 points per inch, cross-cut circular saws up to 16" diameter (24" optional), and band saws up to 24' long. Patented jointing principle automatically evens up large and small teeth, so saws cut faster, truer, cleaner — stay sharp longer. Foley filed saws have less breakage and last longer.

30-DAY TRIAL OFFER

You may have the privilege of using the Foley Saw Filer in your own shop for 30 days. Write or send coupon for details.

TYPICAL SCHOOL USERS

Berea College, Berea, Ky.; Board of Education, Cleveland, Ohio.; Boys Technical H. S., Milwaukee, Wis.; Charleroi School District, Charleroi, Pa.; Redlands Public Schools, Redlands, Calif.; Stout Institute, Menomonie, Wis.

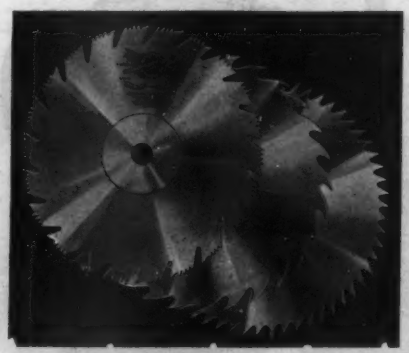
FOLEY AUTOMATIC SAW FILER

FOLEY MFG. CO., 18 Second St. N.E., Minneapolis 13, Minn.
Please send full information on Foley Saw Filer and details 30-Day Trial Offer.

Name .....

Address .....

School .....



THE BEST SAW FOR THE JOB

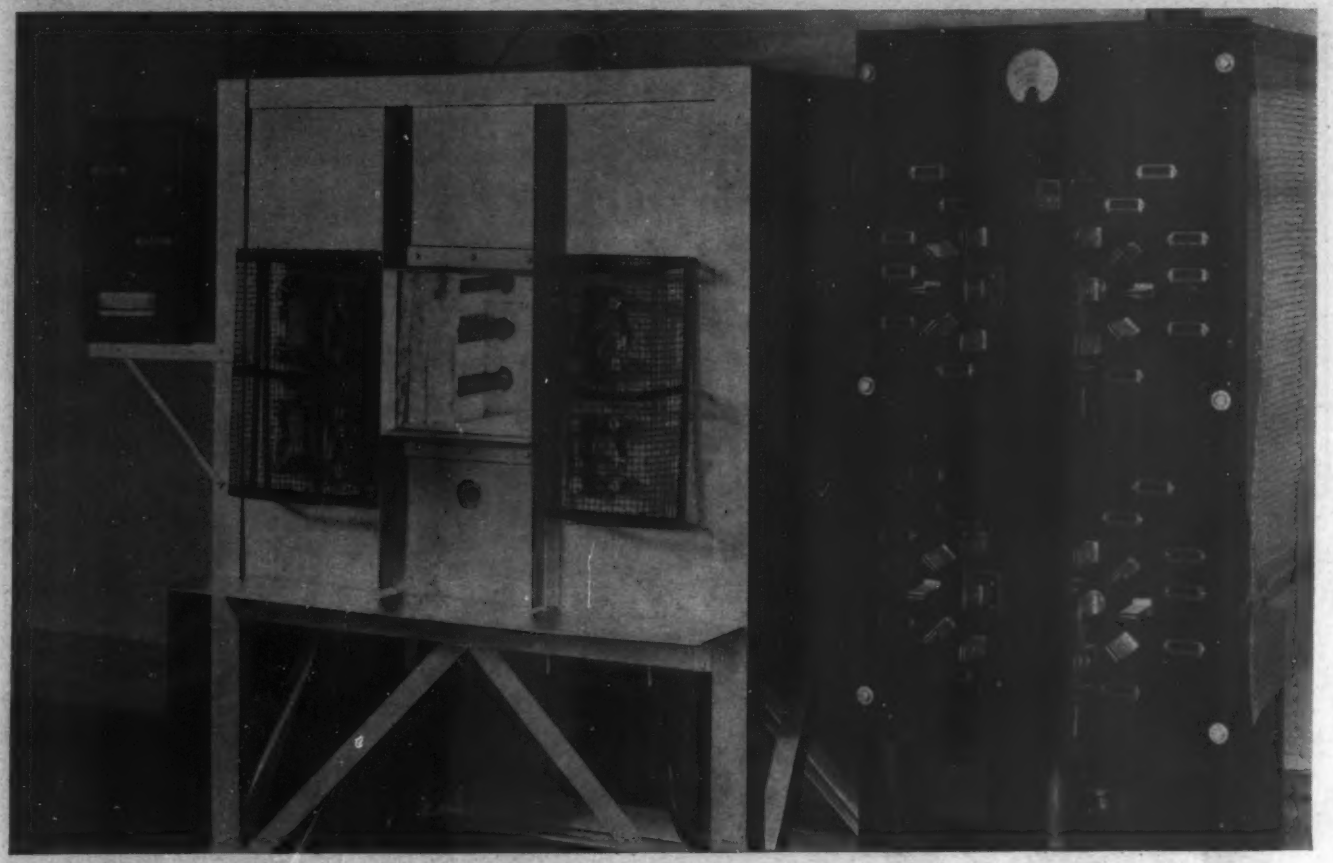
OHLEN-BISHOP'S complete selection of circular saws is your assurance you'll get the right saws for the job when you choose from this line.

Consult our catalog No. 43 next time you order. Illustrated above are:

No. 10 Jointer — No. C-6 Rip — No. C-5 Cut-off

OHLEN-BISHOP MFG. COMPANY
909 Ingleside Ave.
Columbus, Ohio

OHLEN-BISHOP SAWS



WHY GLOBAR*-EQUIPPED KILNS

help you do a better teaching job

HIGH temperature electric kilns equipped with GLOBAR* heating elements insure absolute safety to student, instructor and school property—perfect firing of all types of ceramic bodies—low cost and continuous service without shutdowns for costly repairs. For these reasons use of these kilns for teaching purposes mean greater interest by the student, easier, more pleasant and more effective teaching by the instructor—and the laying of a sound educational background for the development of future ceramic artisans and engineers.

MANUFACTURERS AS WELL AS SCHOOLS AND STUDIOS appreciate the advantages offered by these clean, easy-to-operate, dependable, precision kilns.

The McFeely Brick Company, Latrobe, Pa., manufacturers of "VULCAN" Silica Brick chose this kiln equipped with GLOBAR* Heating Elements for their refractory research work because temperatures and rates of heating could be accurately controlled and conveniently and easily maintained and intermittent temperatures up to 2900° F. could be reached without fuss or bother.

We do not manufacture kilns, but we will gladly assist you in obtaining information on the kiln best suited to your purpose.

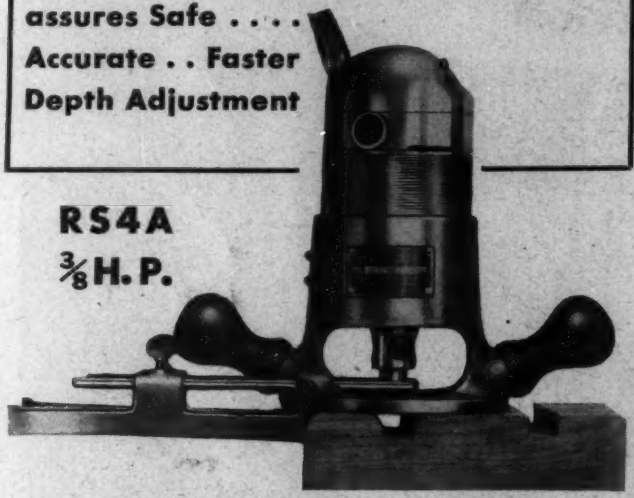
Write us now without obligation. The Carborundum Company, Globar Division, Niagara Falls, New York.

GLOBAR* PRODUCTS
***by* CARBORUNDUM**
TRADE MARK

(*"CARBORUNDUM" and "GLOBAR" are registered trade marks of and indicate manufacture by The Carborundum Company)

EXCLUSIVE
with
STANLEY CARTER ROUTERS

Micrometer Threaded Motor Casing assures Safe . . . . Accurate . . Faster Depth Adjustment



The micrometer adjustment of the improved RS4A Router makes cutting to exact depth easier, quicker, and safer. Adjustment is made by turning the motor unit in the base. No handling of the bit or measuring with a rule is necessary.

One Complete Turn Lowers Cutter 1/16". The motor unit casing is threaded sixteen threads to the inch to fit threads in the router base and in other attachments. Turning the motor one complete revolution to the right or left raises or lowers the bit 1/16".

Three Tools in One. The RS4A can be used for a wide range of work. With one simple attachment, it becomes a shaper; with another, a carver.

Priced Lower! Although it is better-designed, and has more advantages than ever, the RS4A is priced considerably lower than previous models. Write for complete information.

MAIL THIS COUPON

STANLEY ELECTRIC TOOLS, DEPT. C IA246
New Britain, Conn.

Gentlemen: Please send information about Stanley-Carter RS4A Routers for school shop use.

Name.....

Title.....

School Name.....

City..... *State*.....

CARTER STANLEY TOOLS

ARTS & CRAFTS
MARKER of TOMORROW IS HERE TODAY

Marks on Everything Wet or Dry

A Stroke and It's Dry

★ for Drawing, Woodworking, Plastic-craft, Leathercraft, Metal working ★

Literature on Request

★ Handy non-breakable, non-inflammable.
★ Only 3 parts, can't get out of order.
★ Instantly interchangeable, precision fitted nibs. No tools required.
★ Marks at a touch. Speeds work. Eliminates fatigue.
★ Quick, clean, always ready to use.
★ Unconditionally guaranteed for mechanical perfection.

Mfrs. of Floquil Marking Colors and Marking Devices

★ Floquil ★
FOUNTAIN MARKER
Distributors in Principal Cities

FLOQUIL PRODUCTS, INC. • DEPT. V • 1993 Broadway • New York 23

BURRILL'S
Paramount Band Saws

Your students should be provided with *BAND SAW BLADES* which have been adopted as being able to stand the stiff requirements of War Production Plants.

Accurately made Band Saws of extreme toughness enables more work to be produced in less man hours.

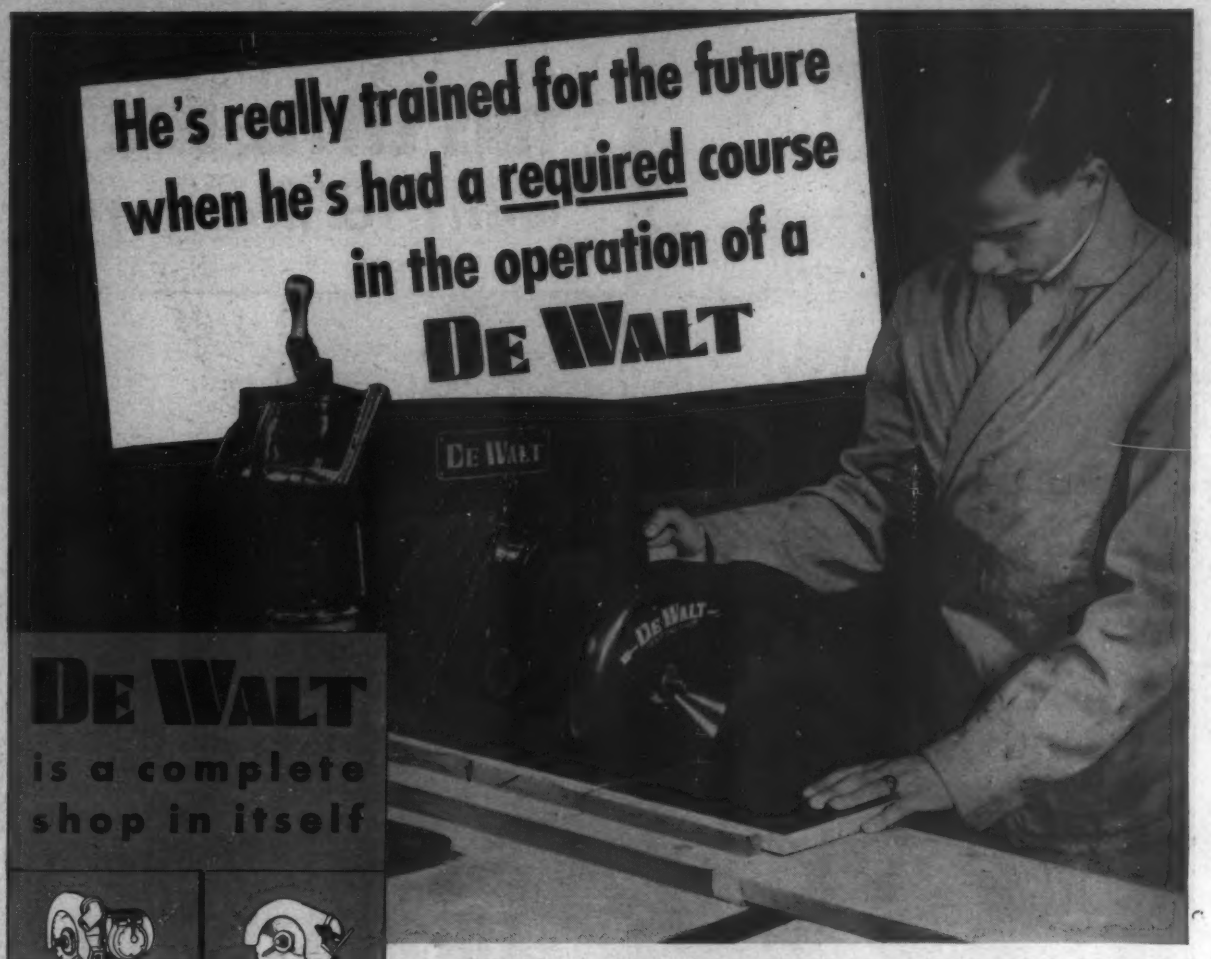
All sizes are carried in stock for prompt shipment.

Exclusive Band Saw Manufacturers.

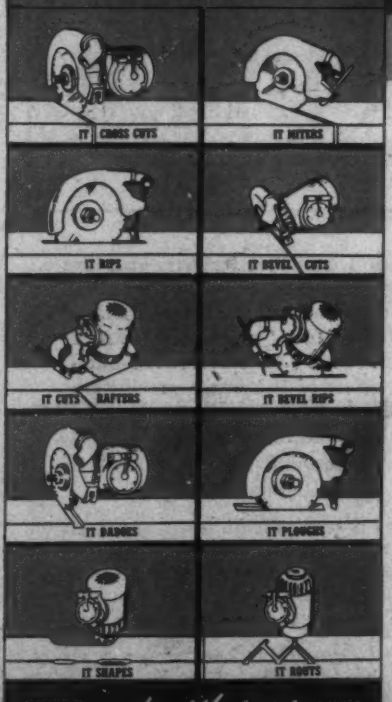
PARAMOUNT SWEDISH BANDS
ACCURATELY SPACED TEETH
NO CRUSHED POINTS - GUARANTEED

BURRILL SAW & TOOL WORKS
ILION, N. Y.

He's really trained for the future when he's had a required course in the operation of a DE WALT



DE WALT is a complete shop in itself



...and with proper tools makes any cut possible!

After the student has completed his basic training course in the use of hand tools, he should have a *required* course in the operation of DeWalt.

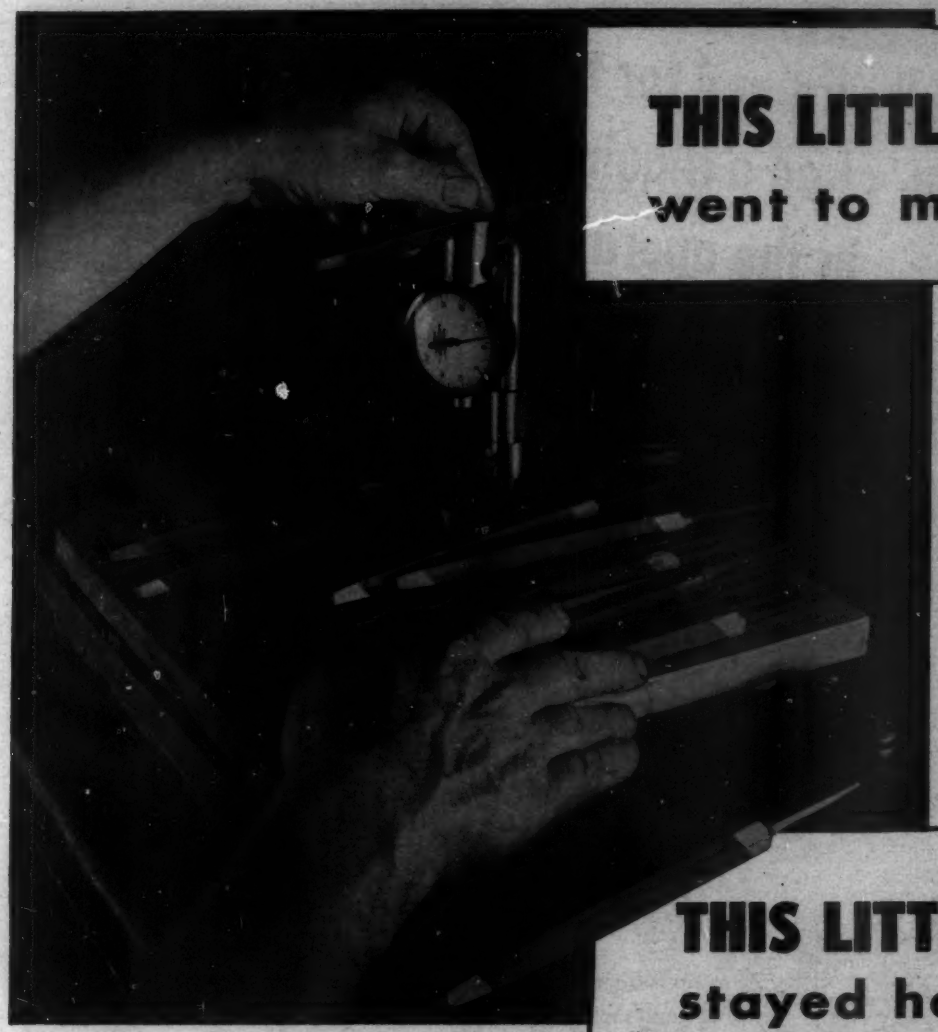
Knowing how to make the fullest use of this flexible, easy-to-operate machine, will give any student a head-start as he prepares for tomorrow's industry.

When he leaves school he will be fully acquainted with a machine that is destined to occupy a prominent place in tomorrow's industry. The perfection of the DeWalt saw has created new methods in cutting wood, making obsolete old-style equipment previously used.

We urge you to investigate DeWalt. *Install* DeWalt in your school.

16 MM SOUND MOVIES—"DeWalt Saws in the War Program" and "The Standard DeWalt Machine." These are the only sound movies on woodworking-machinery now being used by vocational teachers as part of their regular training courses. Write for details.

DEWALT PRODUCTS CORPORATION
122 Fountain Avenue **Lancaster, Penna.**



THIS LITTLE FILE went to market

THIS LITTLE FILE stayed home

THE files that "go to market" under the world-famous Nicholson and Black Diamond trade-marks are only those which can uphold the long-standing Nicholson guarantee of *Twelve perfect files in every dozen.*

Those which "stay home"— the rejects — are the few which fail to pass the score or more of meticulous tests and inspections that guard the various manufacturing stages.

The testing operation illustrated above is one of many. Here, for example, triangular files are being checked, one by one, with a dial gauge to see that edges are uniformly correct and all sides are within proper range of width.

Relentless inspection of steel; forging, grinding and drawfiling inspections — to see that every blank is correctly shaped, even and smooth before cutting; annealing and hardening tests; magnified teeth inspection; tests of soundness; tests of cutting qualities. . . . These are a few of the other precautions taken to maintain Nicholson and Black Diamond file quality as the highest in the world.

Look for further educational topics of this type in future Nicholson advertisements.

THE TRAINED MECHANIC *who has learned the importance of good tools and makes them a requisite to his standard of workmanship, commands a high regard among employers of skilled labor.*

NICHOLSON U.S.A. NICHOLSON FILE CO. • 47 ACORN STREET, PROVIDENCE 1, RHODE ISLAND
(In Canada, Port Hope, Ont.)
BLACK DIAMOND TRADE MARK

NICHOLSON FILES FOR EVERY PURPOSE

Buffalo, the Host City

Buffalo will be the mecca for upward of three thousand visitors who are interested in industrial arts and vocational education when the American Vocational Association meets there on February 6 to 9, 1946, to hold its annual convention.

The questions for discussion are specially important this year, because it is necessary that the gains made in both fields of practical education during the past few years be given a secure and lasting foundation.

There are many weighty questions to be discussed. Naturally, not all of them will be permanently settled, but progress may be predicted definitely if those interested in industrial arts and vocational education will but meet to analyze their problems, see what steps have already been taken by some of the leaders, study the outcomes of experiments that are under way, and then lay plans for making adaptations to the work offered in their own local situations.

It is only when the entire group works together in an open-minded way that real progress can be achieved. Industrial arts and vocational education have both been in the limelight for the past several years. They have been criticized, evaluated, and they have been found to be pretty good. We must now work to make them better, and attendance at the A.V.A. convention may spark ideas that are priceless for the advancement of practical education.

Make your reservations now. Remember Buffalo is the city, Hotel Statler the headquarters, and February 6 to 9 the time.

In the Next Issue

The next issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will be the School Shop Annual.

The material to be used in this annual number of the magazine has been specially chosen to help in planning new school shops or rearranging and revamping those already in existence. Course outlines, too, will get proper attention and there will be offered an extra large miscellany of special interest to teachers both in the industrial-arts field, and in the realm of vocational education.

This Month's Cover

The cover picture this month shows students riveting airplane wing panels at the Burgard Vocational High School, Buffalo, N. Y.

This is one of the schools that those who attend the convention should be sure to visit.

Industrial Arts and Vocational Education

THE SHOP TEACHERS' PROFESSIONAL MAGAZINE

Published monthly except in July and August

THE BRUCE PUBLISHING COMPANY

540 No. Milwaukee Street, Milwaukee 1, Wis.

CENTRAL OFFICE: 105 SO. LA SALLE ST., CHICAGO 3, ILL.

EASTERN OFFICE: 330 WEST 42ND ST., NEW YORK 18, N. Y.

VOL. 35, NO. 2 FEBRUARY, 1946

TABLE OF CONTENTS

Buffalo, the A.V.A. Convention City, *Norton W. Ruth* 47
Objective Guidance in Industrial Arts, *William W. Wills* 50
Industrial Arts to Aid Occupational Therapy, *William F. Holtrop* 54
Michigan Offers Training in Agriculture to "G. I. Joe," *Harry E. Nesman* 57
Prediction of Success in Vocational-Technical Courses, *John C. Broadhurst* 58
Application of Psychological Principles to Woodworking, *Louis L. DeGiacomo* ... 60
Editorials 63
It Isn't So!, *Hyman Goldstein* 64
Vocational Photography, *Richard H. Behrens* 66
"Little Business" and the Part-Time Co-Operative Program, *Snyder B. Keathley* 68
Applied Subjects — Shop English, *R. T. Craigo* 69

Problems and Projects

Concealed Electric Wiring Panel, *Walter B. Weber* 70
Banjo Wall Shelf, *Lyle M. Garnett* 71
How to Estimate the Volume of Oxygen in a Cylinder 72
Fundamentals of Production Illustration, *W. S. Morgenthaler* 72
Simplified Micrometer — A High-School Machine-Shop Project, *H. W. Babcock* .. 75
Table for Primary Classes, *C. F. Zaenglein* 77
Lathe-Drive Unit, *Homer C. Rose* 78
Early American End Table, *Howard Henry* 79
Finding Square Roots Graphically, *J. T. Sawhill* 80
Lightproof Drawer, *C. F. Zaenglein* 81
Tie Clasp, *Rufus Jacoby* 82
Re-employment of Returned Veterans 82
Mock Up for Oven Control of Electric Range, *George H. Wichmann* 83
Marble Game, *R. E. Murray* 84
History and Romance of Animal Glue 85
Whittling-Jackknife Technique, *W. Ben. Hunt* 85
Differences in Type Production Methods, *R. Randolph Karch* 87
Door Knocker and Candlestick Holder, *E. A. Rerucha* 88
Victory End Table, *V. G. Schrodermeier* 22A
Lathe Safety Screen and Some Safety Hints, *G. Harold Billingham* 22A
Attention, G. I. Joe 45A

Personal News 22A
Association News 31A
News Notes 32A
New Publications 38A
Shop Equipment News 40A

Entered January 2, 1914, as Second-Class Mail Matter at Milwaukee, Wis., under Act of March 3, 1879.

Copyright, 1946, by The Bruce Publishing Co. Title registered as Trade Mark in U. S. Patent Office, November 25, 1930.

Published monthly except during July and August.

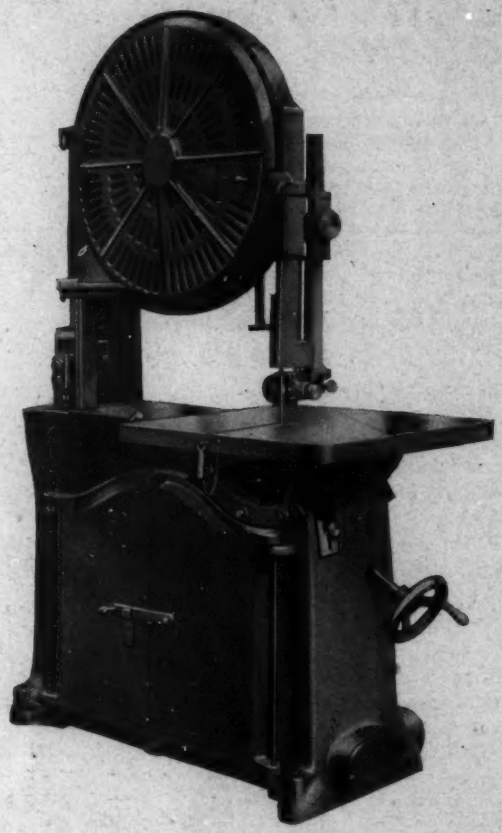
Subscription Information. — Subscription price, $2.50 per year, payable in advance for U. S. and Canada. Foreign Countries, 50 cents. Copies not over three months old, 35 cents; more than three months, 50 cents.

Discontinuance. — Notice of discontinuance of subscription must reach the Publication Office in Milwaukee, at least fifteen days before date of expiration. Notices of changes of address should invariably include the old as well as the new address. Complaints of nonreceipt of subscribers' copies cannot be honored unless made within fifteen days after date of issue.

Editorial Contributions. — The Editor invites contributions bearing upon Industrial Arts, Vocational Education, and related subjects. Manuscripts, drawings, projects, news, etc., should be sent to the Publication Office in Milwaukee. Contributions are paid for at regular space rates. In all cases manuscripts should be accompanied by full return postage.

Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

SPECIFICALLY DESIGNED...UNIVERSALLY ACCEPTED FOR SCHOOL USE



Y-36 BAND SAW

No. 15 of a Series

Basically sound design is fundamentally necessary to the success of any manufactured product. It is as essential as the use of quality materials, and the application of good workmanship.

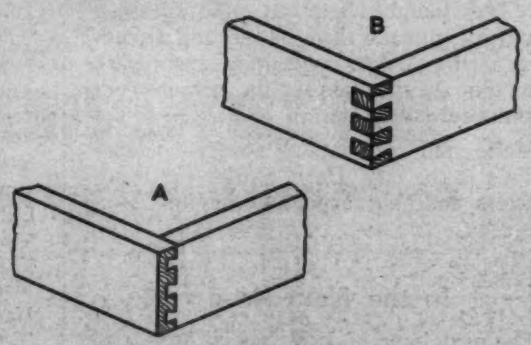
The enviable sales record and wide acceptance that the Y-36 Band Saw has achieved in past years is convincing evidence that it has everything that is needed and desired in a school machine of this type—including good design.

The frame is exceptionally heavy, yet it is so compact that it occupies less floor space than some lighter saws. The combination straight and gooseneck type of column has a distinct advantage over ordinary styles.

A sensitive knife-edge straining device maintains proper blade tension at all times. Adjustable internal expanding brakes provide instantaneous stopping. Wheels and saw blades are completely guarded except at the actual point of cut.

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

JOINTS AND THEIR USES



DOVETAIL JOINT

Considerable skill is required to make this strong, neat joint which derives its name from the shape of the pieces used in its construction. One form, the half-blind, multiple dovetail joint (A) is the best joint known for joining the front and sides of drawers. The tails do not go through, which is particularly desirable from an appearance standpoint. The through, multiple dovetail joint (B) is used in the better type of box and chest construction, and possesses great strength.

YATES-AMERICAN

Buffalo, the A.V.A. Convention City

*Norton W. Ruth**

Buffalo, the "City of Good Neighbors," welcomes the American Vocational Association Convention, to be held here on February 6, 7, 8, and 9.

In the field of vocational education, Buffalo has always been proud of her vocational schools. Nationwide attention has often been focused on various phases of the vocational program and today, it is recognized as a type of educational development which is unique.

From a humble beginning, over 35 years ago, the vocational education movement in Buffalo has steadily progressed. The first school to be established was the Technical High School and later the various vocational schools were organized. Today, in Buffalo, are located six vocational high schools (one exclusively for girls) and one technical high school. This represents an investment of approximately eight million dollars in land, buildings, and equipment.

The Niagara frontier, of which Buffalo is a major part, provides the conditions in which vocational and technical education flourish. In this area, one finds a great diversity of industrial enterprises which are continually in need of trained workers. Through the splendid co-operation of both industry and labor, the Buffalo vocational schools have been able to progress and offer training and instruction on a high, practical plane.

To meet the training needs of such a variety of industries, the Buffalo vocational schools are continually modifying their programs of instruction. This, recently, was carried to an almost unlimited degree in the War Industries Training Program, where a total of 103,636 men and women were given special training for war jobs; classes being held in most schools at all hours during the 24 hour day. Over 85 different courses were offered on this program and more than 1300 instructors were engaged during the five year period.

Then too, throughout the years, the Buffalo schools have always conducted evening school programs. These, in the main, were of the trade extension type and gave workers the opportunity to learn additional skills in the field in which they were employed.

Within the past several months, the Buffalo School Department has been giving special consideration to the problem of training veterans. At the present time, an approach has been made by attempting to integrate veterans into our regular academic and vocational high school program. As the demand for special training is determined, specialized courses for veterans are set up. Already, courses in refrigeration and air conditioning have been started and in a very short time, it is expected that C.A.A. licensed courses and automobile courses will also be in operation exclusively for veterans. In the academic high school field, over 100 veterans are registered in day classes. Some of the veterans lack relatively few credits for their high school diploma and are interested in completing high school "on their own." They then contemplate taking a four-year college program under the provisions of the G.I. Bill. An accelerated high-school program for veterans is not yet in operation, but will be shortly. Such a program, to which only veterans would be admitted, appears to be one of the best ways to satisfy the ever varying needs of veterans as they are being discharged from the Armed Forces.

In all of the vocational schools, the main purpose is to give instruction to boys and girls, who have completed eight grades of elementary school, enabling them to work in the trades and industries as advanced apprentices after completing their high-school education. Students upon completion of their four year program are presented a New York State Regents Vocational High School diploma. This comprises 19 units of credit as follows: English 4 units, American history, civics, ind.

*Boy's Vocational High School, Buffalo, N. Y.

Seneca Vocational High School, Buffalo, N. Y.

economics, 2 units; trade shop work, 8 units; related mathematics, science and drawing, 5 units. One half of each school day is devoted to practical shopwork; one fourth to drawing, mathematics and science related to the vocation selected and one fourth to the regular high-school courses in English and social studies.

It has always been felt in the Buffalo vocational program, that students should not only be trained for work, but also for leisure. So, in all of the schools, there are opportunities for the students to secure instruction in music, physical education, etc. School clubs are organized to meet the immediate interests of those who desire them. Sports of all types are encouraged and competition with teams of the other high schools are promoted.

Buffalo Technical High School

Burgard Vocational High School

This school gained a national reputation during the last decade, and has been used as a model for schools set up in various places, especially for the teaching of aviation mechanics. This is the largest vocational high school in Buffalo and students entering, have the opportunity of selecting one of the following major vocational fields for training, namely: aviation mechanics, automobile mechanics, and printing.

In the aviation course, the students rotate through a series of shops during their four-year programs. They spend from 20 to 40 weeks in each of the following: engine repair, construction, metal machine, electrical, welding, aircraft construction and repair, meteorology, and air navigation. These courses prepare them for positions as licensed airplane mechanic, licensed engine mechanic, airplane factory worker, airport attendant, pilot mechanic, and loftsman.

During the past year, there has been a very noticeable increase in the enrollment in the automobile mechanics course at Burgard. Ten well-equipped shops are used for giving boys instruction in the following branches of the automotive field: electrical, engine, engine testing, general garage practice, collision repairing, battery, tire, chassis, lubrication, machine shop, and welding. Students spend from 10 to forty weeks in each of these shops. Most of the graduates secure positions which lead to garage mechanic, automobile electrician, tire and battery repairman, collision mechanic, automobile factory worker and automobile service specialist.

One of the first courses offered at Burgard in its earlier days was that of printing. Today, the facilities for this type of training have been greatly increased and modernized. Every student pursuing the printing course rotates through all the various printing shops during the four-year period. These shops include hand typesetting, linotype operating, job presswork, cylinder and automatic presswork and lithography.

Emerson Vocational High School

At Emerson Vocational High School, a variety of vocational courses make up the whole school program of vocational education. Courses in baking, tailoring and upholstering, are taught in this school only. In each of these courses, large, well-equipped shops are provided where students can be given practical training in these lines of work on *live jobs*, that is to say, the resultant products are of practical use and have a commercial value.

In the baking course, science is an outstanding subject. The practical instruction is given in a fully equipped bakery located in the school. Bread, cakes, pies, cookies, pastries, etc., are bakery products that are turned out daily.

In the tailoring shop, the students are taught the different kinds and qualities of materials, design and style. They learn how to measure, cut, fit, hand and machine sew, and press.

Upholstering includes springing, padding, stuffing, machine and hand sewing, and covering of furniture, automobile, railroad car and public hall seats. Color harmony and the study of materials with planning and style are covered in the course.

Emerson is also noted for the courses it offers in woodworking, painting and wood

Machine design at Technical High School, Buffalo, N. Y., and Buffalo public schools industrial-arts courses — making pottery

finishing. Boys in these courses are prepared for positions as carpenters, joiners, cabinetmakers, millworkers, exterior and interior painters, and furniture finishers.

Machine-shop practice is also offered in the four recently modernized machine shops in the school.

McKinley Vocational High School

This high school has always specialized in preparing students for entrance into the building trades. The following courses are open to those who wish to specialize in some particular phase of construction work: bricklaying, carpentry, plastering, plumbing and sheet metal work. McKinley also offers courses in machine shop and patternmaking.

One of the newest courses in the field of vocational education to be given in the Buffalo vocational schools, is that of horticulture, offered at McKinley. The school is ideally located to present a course of this type. Adjacent to the school is a large garden area where boys have the opportunity of getting practical experience out-of-doors. Also laboratories, nurseries and greenhouses are on the school grounds so that the students can learn under conditions simulating those of the workaday world, as near as possible.

Seneca Vocational High School

This high school is known as the electrical school of the Buffalo area. This school pioneered in the teaching of electrical work and at the present time offers courses to boys who are interested in electrical construction, repair, maintenance and control. Buffalo, being near to the source of development of electrical power at Niagara Falls, offers many opportunities for graduates in the field of electricity. Seneca Vocational High School has always kept abreast of the new developments in electricity and has incorporated these in the courses offered.

In the field of electrical communication, courses are given in telephone and radio repairing, assembling, and testing. Also, the students are given instruction in electrical wiring, motor repairing, assembling and testing, armature winding, power plant operation, etc. Two of the newest courses to be included in the four year program are those of electronic control and also electricity as applied to refrigeration.

In addition to the foregoing, Seneca has one of the finest machine-shop departments in the city. Four year courses are given in programs preparing students for positions as general machinist and also for tool and die making. Photography is also offered here on a trade level for preparation for positions as commercial photographer, portrait photographer, and photo finisher.

A typical industrial-arts shop in the Buffalo public schools

Buffalo Technical High School

The Buffalo Technical High School is the only one of its type in Buffalo. It prepares students for positions in the junior engineering field. Unit technical courses are offered in advertising arts, building design and construction, junior electrical engineering, industrial chemistry and junior mechanical engineering. These courses are four years in length and have the following aims:

1. To make clear to the pupils the opportunities that exist for junior workers in the various technical fields.
2. To give to the pupil training in the more easily mastered fundamental theories and practices of the technical occupation which he desires to follow.
3. To give the pupil thorough preparation in the pure and applied science and mathematics, of which a junior worker in a special field must have command.
4. To give the pupil a good general knowledge of the tools, materials, processes and methods used in the practical construction or production work to which the special technical service relates.
5. To give the pupil the use of modern technical methods in the solving of problems in some one technical field.

For those students who are interested in going to college, after high school, Technical offers a four year engineering college preparatory curriculum. These students, upon completion of their course will have sufficient credit in English, mathematics, science, foreign languages and history to gain entrance into any engineering college. The prospective engineering college student is introduced into an atmosphere of engineering conditions during his high-school period and is also enabled to do work during his high-school years, for which, in some instances, he receives advance credit toward his college courses.

One of the most promising aspects of the work given at Technical High School

Veterans learning radio at Seneca Vocational High School, Buffalo, N. Y. Training for the clothing trades, Girls' Vocational High School, Buffalo, N. Y.

during the past several years, has been the progressive increase in the number of students who return after graduating from a four-year course, to pursue a fifth year program. At present, fifth-year courses are given in electrical engineering, industrial chemistry, machine design, production planning and tool design.

At Tech, approximately one half of the student's day is devoted to English, history, mathematics and science, while the other half of the day is given to shop, laboratory, drafting and design studies in the particular fields selected.

The Boys Vocational High School

This high school is a type of vocational school where students are prepared for useful employment in the general industrial, distributive, and business fields. During the first year, the students rotate through a series of shop experiences, guidance being emphasized. Such experiences are in the field of electricity, machine shop, sheet metal work, drafting, and commercial work. At the end of the first year, if the student shows inclination and evidence of probable success in any specialized field, he is accordingly transferred and his training is positively pointed at the semiskilled occupations in industry and business. In this way, students are advanced according to developed ability instead of subject accomplishment. It makes for flexibility of procedure and permits the use of all the educational processes employed in such a manner so as to produce in the individual a maximum of social efficiency.

The Girls Vocational High School

The Girls Vocational High School is exclusively set up for training girls in the clothing trades, business trades and food trades. In the clothing trades courses, girls are prepared for positions as dressmaker, novelty needle woman, alterations and repairs needle woman, and power sewing-machine operator. In the commercial courses, training prepares students for jobs as bookkeeper, office clerk, office-machine operator, sales person, stenographer and typist. In the foods trades program, girls prepare for positions in restaurants and hotels, cooks, and nurse's aide.

Industrial-Arts Courses

These courses are offered in the sixth, seventh, and eighth grades in all of the Buffalo elementary schools and these courses are also given in all of the academic high schools. This instruction includes several different types of shopwork, including woodworking, electrical work, sheet and machine metal work, leather craft, printing and home economics. Related studies in various fields of industrial activity form a substantial part of industrial-arts training. Throughout the Buffalo School system, there are over 100 industrial-arts classes in operation at any one time.

Objective Guidance in Industrial Arts

*William W. Wills**

For the past quarter century the growth of industrial-arts education in the United States has been subjected to certain influences of importance. During the period of World War I came full recognition and inclusion in the secondary school curriculum family. The next ten years of peace, plenty and full employment brought little incentive for growth or change. Old and honored concepts of training for hand skills useful in the craft industries appeared to suffice.

Then came the depression ridden 1930's with their abrupt and brutal shift to want and idle workers. Any attempt to develop additional industrial skills in the youth of the country was in disrepute. Small wonder then that industrial-arts leaders turned, ill-advisedly perhaps, and chose to emphasize an avocational or art approach for school-shop activities. This narrow purpose served satisfactorily during the period when industry was unable to absorb the available labor supply.

More recently industry and industrial skills and knowledges have regained much of their lost prestige. Their contribution since the start of World War II clearly shows that not only the defense of the nation but its future economic welfare require full utilization of natural resources and full employment of labor.

Industrial arts teachers in Denver, no less than in other schools of the country, believe that the industrial arts must make a definite contribution to such an end. Industrial arts concepts in the past have been narrow probably, in that they generally failed to recognize the importance of factors other than materials and the skills, processes, and tools involved in the fabrication of products of value. A wider vision of modern industrial-arts education recognizes those other factors involved in a civilization based on international harmony and abundance. The people who produce and consume, the institutions and associations they form, and the ideals for which they strive, must receive equal emphasis. All five factors—materials, tools, people, institutions, and ideals—and their relationships, each with the others, must be recognized and incorporated in any industrial-arts program hoping to meet the challenge of the future.

Such was the thinking of teachers in the industrial-arts department of South Denver High School when, in September, 1943, they introduced a completely revised offering of departmental courses. This new program, frankly experimental, was in their judgment educationally sound, practical in a worldly sense, and cognizant of those social, economic, political and human factors related to an industrial environment.

Five general course areas make up the bulk of the program. These are all broad in scope and each offers several semesters of activity and study. One area, taught in a converted woodwork shop, is concerned with the use of modern industrial materials. Another area, centered in the department's machine shop, gives the student practice and acquaintance with the organization and operation of an industrial plant. Skills in the handling and processing of materials are also developed in these two centers. A third area involves study and laboratory experimentation with the production, transmission and utilization of all forms of power. The fourth area is a series of courses concerned with all forms of modern transportation and their effects upon contemporary life. The fifth area, taught in the drafting room, offers an approach to industrial planning through drafting. Activities here range from home planning to design of clover-leaf turns for the relief of local traffic congestion.

These course areas all stem from a basic course which is primarily concerned with vocational guidance, orientation, and exploratory aims. Enrollments are mostly from 10B groups. During this semester course a comprehensive testing program is conducted in which manual testing devices are used to indicate something of the student's mechanical aptitude, manipulative ability and probable interests. These, tempered by personality, school record and I.Q., are used as bases for counseling and guidance into further industrial-arts experiences. Acquaintance with other industrial arts courses, industrial and mechanical occupations, and the language used in the mechanical world are developed through visitation, motion pictures, surveys, chart and graph construction, elementary mechanical drawing, and blueprint reading. Most learning experiences within the

*Chairman, Industrial Arts Department, South High School, Denver, Colo.

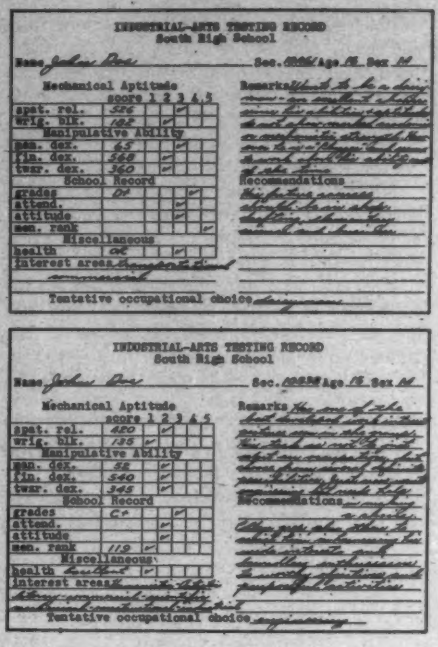
course are of the activity type using pencil, paper, and primary drafting instruments.

Following a semester's trial of these courses, it is possible to briefly review a few of the activities therein. Among these is the testing and guidance feature of the orientation or stem course. Inclusion of such service was considered worth while because most students in the stem course came from 10B groups and needed some objective measure of their abilities, aptitudes and interests before any selection of further industrial-arts courses was made. Guidance for these people in the past had been based largely on subjective evidence and some students had enrolled in advanced courses with meager interest and ability.

The tests constituting the battery are all of the individual manual type. The "Minnesota Spatial Relations Test (form boards A and B) and a wriggly block test were used to indicate mechanical aptitude. A tweezer dexterity test and finger dexterity test were used together with a manual dexterity test board to measure manipulative ability.

"Lufburrow's Interest Locator" was chosen as the instrument to indicate the probable direction and extent of student interest in occupational areas. Indications of individual interests were summarized into occupational or work interest areas with the aid of occupational inventory sheets provided. Each student then possessed a list of several possible occupations compatible with his apparent interests.

Information from the cumulative records such as I.Q., attitude, past grades, attendance and state of health completed the information gathered for each student. This material, plus testing results and interest indications, was entered upon a 4 by 6-inch card for reference purposes. With this record at hand a counseling interview of about fifteen minutes duration was conducted with each of the students.


INDUSTRIAL-ARTS TESTING RECORD
South High School

Name John Doe Sec. 10B6 Age 15 Sex M

Mechanical Aptitude — score 1 2 3 4 5

spat. rel.	526
wrig. blk.	182
Manipulative Ability	
man. dex.	65
fin. dex.	560
twez. dex.	360
School Record	
grades	D+
attend.	
attitude	
sec. rank	
Miscellaneous	
health	OK
interest areas	

Remarks: [illegible]

Recommendations: [illegible]

Tentative occupational choice [illegible]

INDUSTRIAL-ARTS TESTING RECORD
South High School

Name John Doe Sec. 10B5 Age 15 Sex M

Mechanical Aptitude — score 1 2 3 4 5

spat. rel.	420
wrig. blk.	135
Manipulative Ability	
man. dex.	58
fin. dex.	540
twez. dex.	345
School Record	
grades	C+
attend.	
attitude	
sec. rank	119
Miscellaneous	
health	Excellent
interest areas	

Remarks: [illegible]

Recommendations: [illegible]

Tentative occupational choice [illegible]

Fig. 1. Sample record cards

points and shortcomings, and to assist him in forming a practical plan for his future training, both in school and out.

Recommendations similar to those made to the student, were written on the record card. A duplicate of the completed card with records and recommendations was given to the student's general education teacher for use in counseling activities. The record cards shown in Figure I are typical.

General Information

The data presented here is indicative of the type of students involved in the guidance program. They provide some acquaintance with certain general abilities and habits and with the maturity of the group.

It should be indicated here that the 178 students treated in this report were divided into seven class groups averaging slightly over 25 students per class. Each of the three instructors in the industrial-arts department were in charge of two or more of these classes. However, all seven classes followed the same program quite closely and the testing procedures were identical. Forty of the 58 general education groups of the school and all of the 10B groups were represented by one or more students. The attendance record was slightly better than the 8.4 average absences per student recorded for the student body as a whole. The state of health for the students in the guidance program was reported as good with but few exceptions.

Tables I and II show that the students in the group varied from 14 to 17 years of age, and were scattered through all six semesters of the senior-high-school level and that the typical student was a 15 year old boy in Grade 10B. Since the stem course was designed especially for 10B students the predominance of students at that level, 70.6 per cent, is entirely understandable.

Indications of mental rankings shown in Table III were based upon the results of Otis and Terman group tests and XYZ plus and minus subjective teacher ratings. Intelligence quotients and subjective ratings, recorded over a period of several years, were available for all but six of the students. These were pooled and roughly grouped into the five general areas of ability shown in the table. In reading the table it should be noted that 76 of the students or 44.3 per cent were above the average level in ability while only 33 students or 19.1 per cent were below the average group. Apparently the students in the stem course were an above average group or they were typical of an above average school wide student body. The fact that five of the ten girls in the group appear in the superior group is an interesting observation.

To further indicate the type of students in the seven classes involved in this report a measure of past school achievement is included. In the scatter-diagram shown in Figure 2, past grades are compared with

TABLE I. Sex and Chronological Age of Students in the Guidance Program

Sex	*14 years*	*15 years*	*16 years*	*17 years*	*Total*
Boys	11	104	40	13	168
Girls	1	5	3	1	10
Total	12	109	43	14	178
Per cent	6.8	61.1	24.2	7.9	

TABLE II. Grade Level of Students in the Guidance Program

Sex	*10B*	*10A*	*11B*	*11A*	*12B*	*12A*	*Total*
Boys	119	12	23	4	9	1	168
Girls	7	0	1	1	0	1	10
Total	126	12	24	5	9	2	178
Per cent	70.6	6.8	13.6	2.9	4.9	1.2	

TABLE III. Mental Ranking of Students in the Guidance Program

Sex	0–85	86–95	96–105	106–115	116 –	Total
	5	4	3	2	1	
Boys	5	26	61	44	26	162
Girls	0	2	2	1	5	10
Total	5	28	63	45	31	172
Per cent	2.9	16.2	36.6	26.2	18.1	

TABLE IV. Occupational Experience of Students in Beginning Mechanical Drawing

Experience in Months					
0-6	7-12	13-18	19-24	25-30	31-36
28	18	5	3	4	2

Total number of students 60 — *Average length of employment* 10.2 months

During the interviews the instructor attempted to provide a generalized but sensible summary of the student's record and its value in planning for the future, to encourage him to speak of any personal problems and ideas bearing upon his future, to aid him in recognizing his strong levels of mental ability. Each tally, through its position in one of the cells of the diagram, graphically represents the relationship between past grades and level of ability for one student.

Those included in the five diagonal outlined cells had earned grades closely con-

forming to their mental ability level. Fifty-eight or nearly one third had consistently received grades below their capacity. Sixteen, or approximately one tenth, appear to have made a higher grade record than might have been expected. Of the 30 students with superior ability, only 8 were *A* students. Although only five appear in the lowest ability level, 14 were classed as habitual failures.

This analysis of the diagram indicates that the general tendency of the 162 students for whom past grades were available, was toward under achievement. Another ability, (2) motivating influences within the seven classes were not uniformly applied, (3) uncontrollable factors such as after school employment, excessive absence or ill-health may have affected accomplishment or (4) the system of estimating grades was not reliable.

Figure 4 indicates a low correlation between past grades and stem course grades. This meager relationship may be significant in that it suggests the possibility that (1) success in academic work is not an indication of similar success in beginning mechanical drawing, (2) activities in the stem course appealed much more strongly to some students than to others and (3) and in type of work, farming to the manufacture of artificial limbs, was quite wide.

The influence of these work experiences is no doubt reflected in some of the results concerning interests, manipulative ability, and occupational choices.

Subject preferences, as shown in Table V are rather marked. Art, commerce, history, and music subjects polled a like number of likes and dislikes. Science, trades, technical, and especially mathematics were quite markedly preferred. English, foreign language, literature, and journalism were rather commonly disliked. The deduction to be drawn here is that the

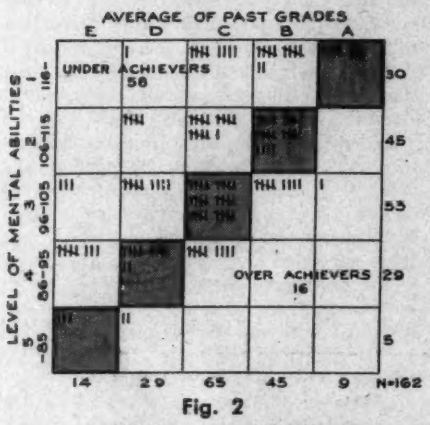


Fig. 2

TABLE V. Subject Preferences Indicated by Students in Beginning Mech. Drawing

Subject Areas	*Likes*	*Dislikes*
Art	27	34
Commercial	12	15
English	27	57
Foreign Language	26	43
History	30	31
Journalism	5	32
Literature	17	34
Mathematics	66	16
Music	25	24
Science	37	15
Technical	28	5
Trades	30	8

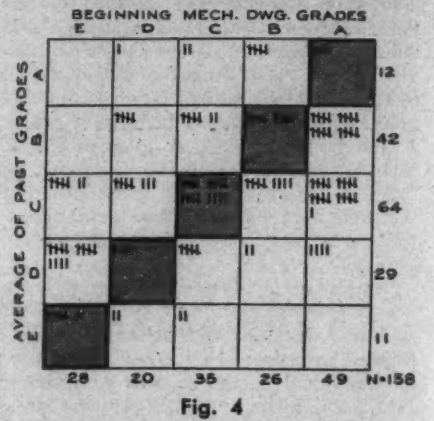


Fig. 4

TABLE VI. Distribution of Scores from the Minnesota Spatial Relations Test Boards A and B

Low		*Medium*	*High*	
5	4	3	2	1
750-641	640-531	530-421	420-311	310-200
6	38	64	33	14

range—550 seconds *step interval—110 seconds* *N=155*
Mean—473.6 seconds *Median—485 seconds*

TABLE VII. Distribution of Scores from the Wriggly Block Test

Low		*Medium*	*High*	
5	4	3	2	1
646-522	521-397	396-272	271-148	147- 23
8	8	19	81	58

range—618 seconds *step interval—124 seconds* *N=174*
Mean—204.3 seconds *Median—180 seconds*

but less defensible interpretation of the diagram suggests that standards upon which past grades were based had been too high and not consistent with actual student ability to achieve.

A similar compilation of data is made in Figure 3, in that levels of mental ability are again compared with school grades—grades awarded students at the termination of the stem course.

Sixty-two of the students received grades on a level lower than their mental ability level. The grades of 54 were above their level of ability. Forty-eight grades and mental ratings were on the same levels. It could be said, therefore, that a few over one third were under achievers, nearly one third enjoyed normal success, and about one third worked above apparent capacity.

Of the 49 *A* students only 29 were of superior mentality. Of the 30 failures in the course but five were from the lowest level of mental ability.

Further interpretations of a more or less contradictory nature may also be obtained from these observations. If the comparisons are significant it would appear that (1) achievement in a course of this type does not necessarily depend upon mental the grades awarded in the beginning drawing course measured achievement of a different nature than that indicated by past grades. The first and last interpretations offer interesting areas for further study.

Study of Table IV shows that 60 or about one third of the 178 students had some past occupational experience. The range in time, two months to three years,

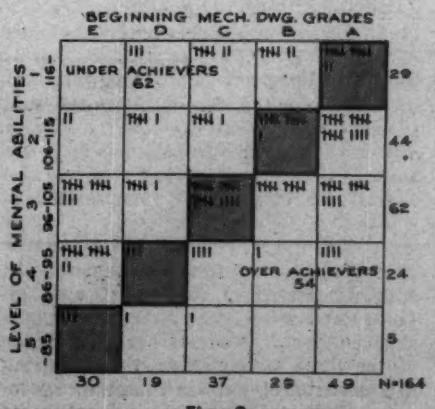


Fig. 3

students studied found more satisfaction working with ideas, materials, symbols, figures and processes than with subjects requiring verbal activities.

Testing and Guidance

Concentration of individual test scores into some convenient and practical form which would indicate their relative standings was necessary before they could be used for guidance purposes. A simple method was employed. After the raw scores were assembled in rank order, the range or difference between extreme scores was divided into five equal intervals. Individual scores then became significant in that they were classified or ranked in five general areas ranging from high to low.

Test scores, as shown in Table VI, indicate the total number of seconds required by the student to complete the test.

A high score on this test is indicative of those attitudes necessary for the rapid perception of size and form. Sculptors, architects, designers, dressmakers, patternmakers, sheet-metal workers, engineers, dentists, surgeons, layout men, auto mechanics and others whose work involves swift recognition of shape relationship find

such aptness of value. School courses such as descriptive geometry and machine design require these same abilities.

The markedly skewed distribution shown in Table VII is difficult to explain. The speed with which the nine parts of the block are assembled is supposed to indicate levels of ability in visualization of three dimensional form, an ability of value in such occupations as machinist, tool and die maker, draftsman, engineer and architect.

Because the scores obtained were so unbalanced and since its reliability is admittedly none too high even in the hands of an experienced administrator, discontinuance of the test is advisable. Some other instrument measuring similar abilities, such as the Minnesota Paper Form-Board, should be substituted.

The finger dexterity test measures aptitude for occupations requiring rapid movement of the hands and fingers in efficient handling and manipulation of small objects. This type of ability is useful in assembly and repair work on clocks, carburetors, radios, aircraft instruments, meters, and other mechanisms of like size.

Table XI indicates the occupational choices made by students at the termination of the testing and counseling activities. In all cases the students, because of their immaturity, were advised to consider their choices as tentative. All were urged to widen their range of interests and to continue study of their fitness for occupational areas which at the time appeared to be attractive. Perhaps the greatest benefit gained by the student through these choices was the acquaintance he made with some for the lack of success in attempting to introduce preinduction courses in South High School during the first semester of 1942–43.

TABLE VIII. Distribution of Scores from the Manual Dexterity Test

(Single Trial)

Low		*Medium*		*High*
5	4	3	2	1
100-89	88-76	75-63	62-50	49-37
3	12	87	62	6

range—63 seconds *step interval—12 seconds* *N=170*

Mean—64.3 seconds *Median—65 seconds*

TABLE XI. Frequency of Occupational Area Selections Made by Students in the Guidance Program

Occupational Area	*Number of Students*
Skilled and semiskilled trades	64
Engineering	25
Agriculture	20
Transportation	16
Art pursuits	13
Military	7
Forestry	6
Scientific pursuits	4
Communication	3
Literary	3
Unskilled trades	3
Sales work	2
Nursing	2
Law enforcement	2
Medicine	1
Undertaker	1
Theater manager	1
Lawyer	1
Clerical	1
Mathematics Teacher	1
Total	176

TABLE IX. Distribution of Scores from the Tweezer Dexterity Test

Low		*Medium*		*High*
5	4	3	2	1
615-539	538-462	461-385	384-308	307-230
9	17	56	65	31

range—385 seconds *step interval—77 seconds* *N=178*

Mean—384.4 seconds *Median—375 seconds*

TABLE X. Distribution of Scores from the Finger Dexterity Test

Low		*Medium*		*High*
5	4	3	2	1
990-861	860-731	730-601	600-471	470-340
5	10	39	95	29

range—650 seconds *step interval—130 seconds* *N=178*

Mean—571.5 seconds *Median—545 seconds*

This type of manual dexterity test, measuring speed of co-ordination between eye and larger muscle areas in the hand and arm, is a simple task independent of form consciousness. Table VIII shows the test results. Its chief use is in determining aptitude for activities similar to those required by package wrappers, butter packers, bank tellers, typists, and garage mechanics.

Although this aptitude matures early it is probable that some factors peculiar to youth, such as adolescent love of physical movement and awkwardness due to an overgrown physique, influences the scores somewhat.

Scores on the tweezer dexterity test measures aptitudes required for precision in the handling of small hand tools and instruments commonly used in surgery, laboratory work, watch repairing, and similar occupations. The results are shown in Table IX.

The 15 lowest scores made on the finger dexterity test cover a range of 230 seconds or one third of the total range. This explains the difference between the two measures of central tendency and accounts for the concentration of scores on the two upper levels where intervals between individual scores were not so wide. The relative positions of these upper level scores, therefore, should be somewhat discounted.

of the procedures and methods of approach to one of the most important decisions of his life—that of making a well considered selection of an occupation.

The tentative selections were made on the basis of aptitude test results, indications of interest, school records and occupational rating scales.

The frequency with which students indicated interest in occupations in mechanical, industrial and constructional fields is both interesting and significant. Ninety-two of the 175 students made choices in these areas.

The fact that over ten per cent of the group want to follow agricultural pursuits is surprising. Since this occupational area was not considered anywhere in the course or in the guidance activities, careful attention was given to these 20 boys after their interests were discovered. Most of them had lived on farms or ranches and it appeared that their interest in agriculture was well founded. Apparently the current migration of rural people to urban, industrial areas was responsible for the appearance of these boys in a city high school. The introduction of courses such as farm shop and agricultural science in the school program would be helpful to these students.

The limited number of boys selecting the military as a vocation suggests an absence of interest which may account in part

The impact of current efforts to educate youth for an air age is apparent when it is disclosed that 15 of the 25 choosing engineering careers want to be aeronautical engineers, and when 11 of the 16 interested in transportation occupations intend to become aircraft pilots. It is hoped that as these boys become more mature they will realize that there is much more to be found in the air age than building and flying aircraft and that these occupations, when army and navy air corps personnel are released, will be distressingly overcrowded.

Of the 175 students, 74 were advised to enter college or take up comparable advanced specialized training. The remaining 101 appeared to lack the abilities necessary for college work and were advised to enter trade courses after high school graduation.

The interest of these boys and girls in engineering and trades is further evidenced by their choice of industrial-arts courses following the stem course. Table XII shows that 152 of the 178 enrolled for the following semester in other industrial-arts classes. A review of Table XI suggests that some 12 or 15 of the students chose occupations toward which the industrial arts could contribute little.

The large number who continued with work in industrial machines is probably

TABLE XII. Frequency of Industrial-Arts Course Selections Made by Studens Following the Completion of the Stem Course

Industrial Arts Courses Selected	*Number of Students*
Industrial machines—(drafting)	74
Aircraft construction—(industrial materials)	39
Industrial production shop practice—(machine shop)	22
Transportation mechanics	9
Power production and transmission	8
Total	152

not significant since their activities in the stem course were largely elementary drafting and industrial machines, which is basically drafting, on a more advanced level. Furthermore, these students realize that a knowledge of drafting is essential in any mechanical pursuit.

Summary of Data

1. Guidance activities were carried on with 178 students enrolled in seven class groups following the same program. The typical student was a 15 year old boy in Grade 10B.
2. Although one third of the group had a record of past grades below their apparent ability, one tenth of the students were consistently working above their level of ability.
3. Over one third of the group received marks in the stem course below their level of ability while the marks of nearly one third of the students were above their mental ranking.
4. If past marks and stem course marks were accurately compiled, there appears to be but low correlation between the two.
5. One third of the group had occupational experience for an average of 10.2 months each.
6. The students generally disliked courses involving verbal activity and preferred mathematics, science, industrial and trade classes.
7. Scores made in the testing program appear to indicate that average mechanical aptitudes and manual abilities were possessed by the group.
8. As a group, the students indicated a strong interest in and preference for occupations in mechanical, industrial and constructional areas.
9. Six sevenths of the group have continued with other industrial-arts courses during the current semester.

Conclusions

1. An objective study of interests, abilities, and aptitudes is of value in effective vocational guidance for secondary school students.
2. The present testing and guidance program in the South High School industrial-arts department can be improved.
3. If the present industrial-arts guidance activities are continued, additional teacher time for counseling and planning should be provided.
4. Industrial-arts guidance activities should involve a larger portion of the South High School student group.

Industrial Arts to Aid Occupational Therapy

*William F. Holtrop**

Occupational therapy as a means of bringing people back to normal life has taken on much more significance during the past few years. Especially is this true since this nation became embroiled in the world's greatest conflict. Now that peace has returned to the world, the work of occupational therapy is even more in demand. Of those men who participated in the actual fighting and subjugation of the enemy, many will never return. A large number, upon discharge, will re-enter civilian life with little effort, quickly adapting themselves to a world at peace. In between these two categories, however, we find a group that will require care and treatment for some time to come. This is the returning war veteran, wounded in action, either mentally or physically incapable of taking his place in a complex society.

A Brief History of Occupational Therapy

Occupations of some sort as a therapeutic measure have been used for many centuries. Although old in years, only recently have such measures been systematized and developed along scientific forms. Galen, the great Greek physician said in A.D. 172: "Employment is nature's best physician, and is essential to human happiness."

The renowned French physician, Pinel, advocated occupations as a means of recovery from mental disorders. His works in the treatment of the insane and those afflicted with less severe mental disorders are, to this day, considered by many the best ever written on this subject.

A Dr. Benjamin Rush in a letter written to the manager of the Pennsylvania Hospital in 1789 suggested work as a remedial measure. Lacking the activities of our present day, he mentioned the use of ordinary domestic duties of the time, such as: grinding corn, spinning, sewing, churning, and weaving. In later writings, he urged that facilities be provided for different occupations.

In England the establishment of York Retreat was started in 1792 and completed by 1796. Patients were taught to live as natural and orderly lives as possible. This was accomplished by providing for different kinds of work and occupations.

An article in "Archives of Occupational Therapy" gives an interesting picture of the development of occupational therapy in this country. From the minutes of the visiting Committee of the Board of the Society of the New York Hospital, of December 1, 1821, is recorded the following:

> As far as circumstances would permit, amusements of various kinds have been introduced and a number of the women have been employed in spinning wool and flax, sewing, knitting, etc., No employment has yet been found for the men, except that some have worked on the farm or in the garden.[1]

From the same source dated April 30, 1827:

> Our present means of employment and amusement are limited; a daily walk or two, an occasional ride, playing at nine pins, cards, draughts, backgammon, an opportunity once in a while of reading a journal of the day, comprises the sum of our amusements.[2]

Though it may appear that progress was slow, there was sometimes no limit to which some hospitals would go in order to furnish amusement for their patients. For example, Friends Asylum, founded in 1813 along lines similar to those of the York Retreat in England, built a circular railway 400 feet in circumference, with self-propelling car and sound effects. This institution also stressed occupations of various kinds.

The Civil War period and the years of reconstruction were a retarding factor for the development of occupational therapy in the United States. Not until 1890 are reports available from the afore-mentioned New York Hospital. The time since 1890 marks the transition period of the old ideas of occupations to the present-day methods of employment with the aid of crafts. This revival led to the opening of a new occupational pavilion at the New York Hospital in May, 1916.

It is about this time that one notices the first organized approach in the training of occupational therapists. The Chicago School of Civics and Philanthropy started a course of training for hospital attendants in 1908. The success of this course is be-

*Alexander Hamilton High School, Los Angeles, Calif.

[1] Haas, Louis J., "One Hundred Years of Occupational Therapy, a Local History," *Archives of Occupational Therapy*, 1924, p. 83.

[2] *Ibid.*, p. 84.

lieved to have led to the organization of the Henry Farrill School in 1914.

The publication of Miss Susan E. Tracy's "Studies in Invalid Occupation" established occupational therapy upon a scientific basis. It was her numerous courses that marked the beginning of regular training schools for occupational therapy.

During World War I many foreign countries, especially Belgium, France and England realized the value of occupational therapy in promoting recovery and rehabilitation. When it became obvious that the United States could not stay out of the conflict very much longer, a meeting was called of some of the leaders in the field of occupational therapy. The result of this meeting on March 17, 1917, at Consolation House, Clifton Springs, N. Y., was the formation of the National Society for the Promotion of Occupational Therapy. This name was later changed to American Occupational Therapy Association. Publication of its official journal, "Archives of Occupational Therapy," started in February, 1922. Three years later the name of this magazine was changed to its present title, "Occupational Therapy and Rehabilitation."

Lacking endorsement by the medical profession, volunteers who offered their services as occupational therapists were not overenthusiastically received. Finally, about one dozen therapists were sent overseas. It was because of this small group who had to overcome many handicaps and hardships, that General Pershing in September, 1917, sent for 200 therapy aides.

After the close of World War I many of the training centers for occupational therapists were closed and while the program continued its advance toward a more complete science, it lost some prestige in the public eye. Its status was significantly raised with the formation and adoption of national standards of training and the establishment of a national register for qualified therapists. Its crowning achievement was attained recently when the American Medical Association recognized these standards. Not only did the medical profession acknowledge the value of occupational therapy, but also a number of medical schools have initiated training courses for future therapists. With such recognition and support the program of occupational therapy should function much better after World War II than it did after World War I.

Some Definitions of Occupational Therapy

Definitions of occupational therapy differ somewhat among experts in the field. Since it consists of two main parts, namely, mental and physical treatment, a definition may include one of these, or both. In his book "Principles and Practices of Rehabilitation," John Eisele Davis defines occupational therapy as "an activity, mental or physical, prescribed by a physician for its remedial value."[3]

He defines rehabilitation as follows:

> Rehabilitation shall mean the rendering of a person physically handicapped fit to engage in a remunerative occupation. One must be satisfactorily employed in a remunerative occupation, to be rehabilitated.[4]

Dr. H. A. Patterson in an article on "Definitions of Occupational Therapy" uses the following definition:

> Any activity, mental or physical, definitely prescribed and guided for the distinct purpose of contributing to and hastening recovery from disease or injury.[5]

The definition by Mrs. Eleanor Clarke Slayle reads as follows:

> It is directed activity and differs from all other forms of treatment in that it is given in increasing doses as the patient improves.[6]

She sums it up by stating that anything that diverts the patient from unhealthy thought may be classed as occupational therapy.

Established Standards for Courses of Training for Those Entering the Field of Occupational Therapy

It was pointed out before that standards for courses of training were established on a national scale. Following are these standards as presented and formally adopted at the annual meeting of the American Occupational Therapy Association, at Milwaukee, Wis., October 30 to November 1, 1923:[7]

Minimum standards for courses of training.

I. Prerequisites for admission:

1. *Age* not to be less than 20 years at graduation.
2. *Education*. High school diploma or its equivalent. One year college desirable; successful employment or actual commercial experience acceptable.
3. *Character*. To be of good character and general fitness.
4. *Health*. Present medical certificate of good physical and mental health.
5. *Probationary period*. Students in training schools will complete a probationary period of 30 days.
6. *Credits*. Previous special training will be properly evaluated.

II. Length of course:

The minimum length of the course shall be 12 months, while the hours of work and lectures shall not be less than 6 daily.

III. Course content:

1. The course shall include not less than eight months of theoretical and practical work and not less than three months of hospital practice training under supervisors.
2. Theoretical work. This shall include lectures on the following subjects: the several principal fields of medicine and surgery; psychology; physiotherapy (with demonstrations); medical social service (with demonstrations); psychiatric social service; social relations (general sociology); the several types of hospitals as general, mental and nervous, tuberculosis; hospital ethics, and management with particular reference to the relation between the occupational therapist and the hospital organization; personal hygiene; mental hygiene; the history and theory of occupational therapy; the history and development of arts and crafts and their relation to civilization; the theory of design; the history and development of art; modern industry and the factory system; the relation of occupational therapy to vocational rehabilitation including the work of the Federal Industrial Rehabilitation Act; disease of children.

Not less than 75 hours shall be given to lectures. It is particularly desirable that adequate instruction shall be given in:

a) Psychology, normal and abnormal
b) Anatomy, kinesiology, and orthopedics
c) Mental diseases
d) Tuberculosis
e) General medical cases, including cardiac diseases.

3. Practical work in arts and crafts. Training in arts and crafts shall include work in the following subjects: woodworking, including toymaking; wood carving; brushmaking; weaving, including spinning; hand and foot power looms, up to six harness looms; basketry, including work in willow, rattan, raffia, cane, rush, and fiber; metalwork and jewelry, including sheet-metal work in tin, copper, and brass; leatherwork, including simple book binding; mat and rugmaking; plastic work, including modeling in clay and composition; pottery and cement work; needle crafts, including petit point and simple garment making; stenciling and block printing; dyeing, including batik and tied work; knotting, netting, and cordwork; applied design; mechanical drawing.

Not less than 1080 hours shall be devoted to instruction and practice in practical handiwork, including drawing and design. It is particularly desirable that considerable time be devoted to, and adequate instruction provided in the following crafts and their subdivisions: woodwork, weaving, basketry, metalwork, jewelry, drawing, and applied design. Schools are at liberty to arrange that work in minor crafts may be done out of school hours. Throughout the course, some properly qualified member of the staff should be given the duty of interpreting the practical work, as far as may be possible, in terms of theory and psychology.

A Survey of Industrial Arts As An Aid to Occupational Therapy

So far we have presented a general overall view of the program of occupational therapy as it has developed and is carried

[3] Davis, John Eisele, *Principles and Practices of Rehabilitation*, p. 169.

[4] *Ibid.*, p. 169.

[5] "Definitions of Occupational Therapy," *Occupational Therapy and Rehabilitation*, Vol. 19, February, 1940, p. 36.

[6] *Ibid.*, p. 36.

[7] *Archives of Occupational Therapy*, Vol. 4, August, 1924, pp. 297–298.

out at the present time. Now we shall see how industrial arts as established in our educational system may be of help in aiding this program of occupational therapy. Some similarities are immediately obvious. For example, the equipment required for both programs is very much alike and the training required for those carrying out the two programs has some similarities. In both programs the person in charge must be capable of showing others how to make articles with their hands in a number of different fields of activity.

Examination of a recent school directory for the city of Los Angeles reveals that there are 29 junior high schools and 42 senior high schools, all of which have an established industrial-arts department. An examination of the course of study for these junior high schools reveals that students are offered an oportunity to participate in the following activities:

1. Drafting
2. Handicraft or agriculture
3. Woodwork
4. Electricity
5. Metalwork
6. Printing

Students in senior high schools may choose their activities from the following:

1. Mechanic arts
2. General metal
3. Drafting
4. Automechanics
5. Electricity
6. Sheetmetal
7. Radio
8. Woodshop
9. Printing
10. Cabinetmaking
11. Household arts
12. Art and crafts

While reading the objectives for industrial arts one observes that these activities are not merely offered for the sake of the activity itself, but as a means to develop such intangible factors as desirable traits, work habits, and training in good citizenship. The instructors are usually expert in their assigned activity either by training or actual experience in the field. Many of them can successfully teach a number of the activities listed in the standards of training for occupational therapists. Although not experts in the field of psychology, they have taken some work in this field and know the principles of learning and human behavior. Lack of such training might be substituted by a number of years of successful teaching experience.

An activity somewhat different from the ones described here is offered by the San Diego school system. Called the "creative laboratory," a number of activities are carried out all within one room or shop. The following crafts are taught in this laboratory:

1. Metalwork
2. Bookbinding
3. Jewelry work
4. Leathercraft
5. Lapidary work
6. Pottery
7. Weaving
8. Woodworking

The philosophy of this program given by Ferd V. Liotta fits well the one for occupational therapy:

> A place where boys, girls, and adults can come to make use of tools, equipment, and materials to construct and develop any worthwhile project using any medium that will stimulate thinking, allow the co-ordinate use of hands and mind and an opportunity to develop and practice desirable leisure time hobbies.

An Evaluation of the Training Institutions for Teachers in Industrial Arts

Something already has been said about the training of the teacher of industrial arts and wherein this training is similar to that of the occupational therapist. Where such training may be obtained will be discussed next. A survey of recent catalogs of some of the teacher-training institutions in the state of California reveals that Santa Barbara College offers an extensive list of courses for the occupational therapist. In particular the course listed as industrial-arts crafts seems to be most appropriate for this type of training. For a more concise picture of such courses refer to Table I. It may be noticed that from the standpoint of courses offered, Santa Barbara College appears to be the most outstanding. This is not surprising since its department of industrial arts ranks as one of the most outstanding throughout the United States.

A survey of a number of junior colleges also reveals that they have possibilities as training centers for prospective occupational therapists. For a quick overview these possibilities are shown in Table II.

Conclusions

From the foregoing discussion it becomes apparent that occupational therapy has developed into a highly scientific profession. Those who carry out this type of work must be highly trained and endowed with certain characteristics that make success in this field possible. It also has been pointed out that there is a certain amount of similarity between the program of occupational therapy and that of industrial arts. With those similarities in mind we may make the following suggestions and recommendations:

1. Because of similarity of physical

TABLE I. Industrial-Arts Courses Offered in California Teachers Colleges and Santa Barbara College, Adaptable to a Course in Occupational Therapy

Courses:	*California State Teachers Colleges*						
	Santa Barbara College	*Chico*	*Fresno*	*Humboldt*	*San Francisco*	*San Jose*	*San Diego*
Hand woodwork	1	1	1	1	1	1	
Machine woodwork	1	1	1	1		1	
Wood turning	1	1	1	1	1		
Wood carving	1						
Patternmaking	1	1					
Toy craft		1	1	1	1		
Reed furniture			1				
Upholstery	1				1	1	
Cement work	1	1		1		1	
Wood finishing	1	1	1		1	1	
Painting	1		1			1	
Industrial crafts[1]	1		1	1			
Metalwork	1	1				1	
Forging	1	1	1			1	
Welding	1	1	1			1	
Machine shop	1	1				1	
Art metal	1	1	1	1		1	
Graphic arts	1	1		1	1	1	1
Basic radio	1	1					
Pottery		1		1			
Modern plastics	1			1			
Totals:	18	15	11	10	6	12	1

TABLE II. Courses Offered in Six California Junior Colleges, Adaptable to a Course in Occupational Therapy

Courses:	*Six California Junior Colleges*					
	Los Angeles	*Modesto*	*Compton*	*Ventura*	*Pasadena*	*Glendale*
Anatomy	1		1	1		1
Art	1	1	1	1	1	1
Bacteriology	1	1	1	1	1	1
Biology	1	1		1	1	
Chemistry	1	1	1	1	1	1
General education	1					
Home administration	1				1	
Home economics	1	1		1		1
Health				1		
Hygiene		1				1
Industrial arts					1	1
Nursing					1	1
Physics	1				1	
Physiology	1	1	1	1	1	1
Physical therapy						1
Psychology	1	1	1	1	1	1
Sociology	1			1	1	1
Zoology	1	1	1	1	1	1
Totals:	13	9	7	11	12	13

[1]Industrial arts crafts at Santa Barbara College lists the following subdivisions: reedwork, novelty painting, simple upholstery, woodwork, leather craft, metal tooling, rope work, whittling, carving, plastics, glass engraving, etching, Indian craft, and others.

requirements, industrial-arts shops whenever possible should be used to further the program of occupational therapy. This might be accomplished by using the shop facilities at times when they are not used by the public school students, namely vacations and evenings.

2. While industrial-arts teachers are by no means trained therapists, they may be used because of training and experience, as aids and assistants to the trained therapists. Many teachers now conduct evening classes. Instead they might offer their services to hospitals where a program of occupational therapy functions.

3. While teacher-training institutions are established primarily in order to train prospective teachers, the industrial-arts departments in these institutions offer a good opportunity to train prospective therapists in the many crafts which they are required to know. Such students might be offered courses shortened in length of time, but highly intensified for their particular purpose.

4. While many junior colleges offer so-called terminal courses, it seems advisable to offer such short unit courses that are particularly suitable for the training of occupational therapists.

Michigan Offers Training in Agriculture to "G.I. Joe"

*Harry E. Nesman**

Of Michigan's 600,000 soldiers, one out of every ten is returning to the farm. According to a recent survey, half of these 60,000 returning farmers want training in agriculture.

The school of Agriculture of Michigan State College supplies training for some of these veterans. But a large number, probably about 25,000 veterans, will want training in agriculture in their own community. To meet the needs of these veterans, to aid them in the unfolding of their ambitions to become successful farmers, Dr. Eugene B. Elliott, Superintendent of Public Instruction, has developed a special program of agricultural training for veterans who are returning to farms. In this new program the veteran may receive training while he is employed as a full-time worker on a farm, or as a farm operator, renter, or owner.

Local farm-training programs for veterans are established and operated by the local superintendent of schools and agriculture teacher, acting with the advice of a local committee made up of persons familiar with farming conditions in the community.

The evidence so far shows that the veteran will usually need a combination of on-the-job training and related instruction in agriculture. The new skills and abilities to be acquired by the veteran on the farm will be learned under the supervision of the teacher of vocational agriculture or some other well-qualified person. The *why* and the *know how* of new developments and practices in farming will be taught in regular adult evening classes which will bring him into close fraternal association with his farmer neighbors, and thus hasten their acceptance of him.

The Michigan program supplies 150 hours of specialized instruction each year. At least 50 hours of on-the-job training and not more than 100 hours of related

An adult evening class in farm machinery repair receiving related instruction

Left — adult evening class in farm tractor repair where student is attending. Right — a student securing on-the-job instruction by the teacher of agriculture on keeping accurate farm accounts

*Chief, Division of Agricultural Education, Michigan State Board of Control for Vocational Education, Lansing, Mich.

agricultural instruction are thus provided. By this distribution of time, "G.I. Joe" will be eligible to obtain subsistence payments from the Veterans Administration.

The Michigan program does not have as its aim the provision of cheap labor for farms. In all instances an equitable agreement must be made by the employer concerning the wages the veteran is to receive, and also as to his future wages when he has become more efficient at his work. In this program, as in many others which are aided by the benefits of Public Act 346 (Servicemen's Readjustment Act) the Veterans Administration will reimburse the veteran who is working on the job for the difference between the salary he would receive if trained and the amount paid by his employer during the training period, but in no case will such payment exceed the maximum amounts provided by law.

A new Michigan education institution, created purposely for the veteran, is the Veterans' Institute. When established by a board of education, tuition may be charged to cover costs of instruction. The school will be reimbursed for this tuition by the Veterans Administration.

Subsistence payments with a maximum of $50 per month for single veterans and $75 per month for married veterans will be available during the time when the veteran is getting his training and working full time on the farm. These benefits will doubtless finance many enterprising young men over some rough days at the beginning, when the farm is producing a scanty revenue. It may save for farming many top-notch farm boys who otherwise might have to go into uncongenial work to earn enough money to establish themselves.

An agricultural teacher giving on-the-job training in care and feeding practices of sows with pig litters

All Michigan superintendents of schools have been enlisted in the cause of organizing training programs for the veterans in their communities. Two hundred departments of vocational agriculture and 85 rural agricultural schools have been mobilized to conduct training programs in agriculture for veterans.

If "G.I. Joe" comes back to Michigan with an urge to take up farming, he will find that the public school of his community and the agricultural department of his state college stand ready to supply him with training.

Prediction of Success in Vocational-Technical Courses

*John C. Broadhurst**

Requirements for admission into the Vocational High School, Bayonne, N. J., specify that each male entrant must have completed the ninth year of junior high school and a year's work in elementary algebra.

During the tenth year each student follows a common vocational curriculum which is outlined in Table I.

The only variable in this common curriculum is that of shopwork. Each student may elect four shops[1] for 10 weeks each. This curriculum is designed to give a general trade training, to function as part of the guidance program and lastly to stabilize the student's final vocational choice.

At the end of this tenth year all pupils are classified as vocational industrial or vocational technical. This classification is made on the basis of grades in mathematics and physics, students' interests, and teachers' recommendations.

Only those students who have grades of 80 or who have been recommended by their teachers on a final rating sheet are permitted to take the vocational-technical courses. This barrier is definite and unyielding except in cases where parents want the boy to take these vocational-technical courses despite the boy's inability to meet the requirements.

Table II describes the offerings within the two general areas which may be somewhat loosely defined as follows: Vocational-industrial courses are those organized for the students who will ultimately seek employment at levels of industry which emphasize manual skills, but do not stress technical knowledge. Conversely, vocational-technical courses emphasize

*Vocational High School, Bayonne, N. J.

[1]The shops are: machine shop, electric wiring, electrical testing, welding, power engineering, automotive, printing, sheet metal, and air conditioning.

TABLE I. Common Tenth-Year Curriculum

Subject	*Periods Per Week*	*Number of Semesters*
English and social studies	5	2
Intermediate algebra	5	1
Abridged geometry	5	1
Industrial mathematics	4	2
Drafting and blueprint reading	4	2
Shopwork	10	2
Health	2	2

TABLE III. Summary of Questionnaire Survey

Subject	*Frequencies of Relative Weights*						*Approximate Weights*
	0	*1*	*2*	*3*	*4*	*5*	
Pure mathematics	3	5	5	6	1	2	2.14 (2.1)
Applied mathematics	—	—	1	3	6	12	4.30 (4.3)
Pure science	3	7	3	6	1	2	2.04 (2.0)
Applied science	—	—	2	3	7	10	4.14 (4.1)
Social studies	—	3	6	10	2	1	2.64 (2.6)
Shop	—	—	1	5	4	12	4.22 (4.2)
Drafting	—	—	1	5	6	10	4.14 (4.1)

TABLE II. Areas of Specialization Possible Within the Fields of Vocational-Technical and Vocational-Industrial Courses

Vocational-Technical: Metal trades—drafting, industrial chemistry, power engineering, technical electricity, air conditioning—refrigeration.

Vocational-Industrial: Machine-shop practice, carpentry, auto servicing—repair, printing, industrial electricity, welding, pattern and cabinet making.

technical knowledge rather than manual skills.

Each student must complete two years in either a vocational-technical or vocational-industrial course to get his high-school diploma.

It has been a general observation, however, that those students who entered the vocational-industrial field were more ideally adjusted to their environments than were those who followed vocational-technical courses.

Consequently in October, 1941, under the guidance of Edward Berman, assistant superintendent of schools in charge of vocational education, four standardized tests were administered to 74 students who had already been classified as vocational-technical. These tests were given to find out the value of standardized tests as predictive instruments.

The tests were: (*a*) the Pressey Senior Classification and Verification Tests intended for comparing classes, schools, or other groups as to general ability. Both tests were given and the higher of each pupil's two scores was taken as his final rating. (*b*) The Thurstone Arithmetic Test. This test requires not only arithmetic ability but also a fair reading knowledge. The problems are technical in nature and the test has been used successfully at the Carnegie Institute of Technology. (*c*) Likert and Quasha's Revised Minnesota Paper Form Board Test—Form AA. This test attempts to measure the ability to visualize spatial patterns in two dimensions. (*d*) The Iowa Placement Examination, Mathematics Training—Form MT1. This test has four sections: arithmetic manipulation, elementary algebra, geometry, and advanced algebra.

Since the first semester had always proved critical in the past, it was decided to correlate these test results with a criterion score based on the first semester's work. Perhaps the most important and weakest item in test battery correlations is the criterion score. In this study, grade averages in each subject were first computed, then fitted to one of the seven categories which had been weighted according to authoritative judgments. Each average was multiplied by its proper weight, those products were then added, and finally those totals were divided by the cumulative weight to give a weighted average or criterion score. Table III presents the weights given to each category by 22 out of 30 authorities in vocational education who returned questionnaires to the writer.

All test grades were then correlated with the criterion scores. Table IV summarizes these intercorrelations. Numbers above the diagonal represent the original Pearson product-moment values; numbers below the diagonal are the final partial correlation values.

Evidently the Iowa Mathematics and the Thurstone Arithmetic Test correlated with the criterion to a far greater extent than did the other tests. In fact, the net effects of the Form Board Test and the Pressey Classification Tests were almost zero. According to Hull[3] any test with an *r* value of less than .50 falls below the lower useful limit of forecasting efficiency.

The test battery itself had a multiple correlation coefficient of .53 which denoted a forecasting efficiency of 15.2 per cent better than chance. This seemed low but "correlations on genuine aptitudes running above .70 or .75 are so rare at present as to be practically nonexistent."[4]

Correlations, however, do not give a complete picture of the relative importance of the four independent variables. Beta weights are necessary to give those direct comparisons.

This table indicates that of the total variation caused in the criterion by these tests, 65 per cent was accounted for by variations in the Iowa Mathematics Test. At the other extreme, only 3 per cent was caused by variations in the Form Board Test. These results illustrated the evident superiority of the two mathematics tests. In fact, the Iowa Mathematics Test alone was almost as good a predictor as the entire test battery.

The final regression equation for the test battery was: $X1 = .236X_2 + .012X_3 + .272X_4 + 67.79 + .013X_5$; X_1 predicted weighted averages, X_2 raw score in Form Board Test, X_3 raw score in the Thurstone Arithmetic Test, X_4 raw score in Iowa Mathematics Test, X_5 raw score in Pressey Test.

This regression equation was used to calculate the predicted weighted average of each of the 74 students who took all four tests. These predicted weighted averages were then compared with the actual weighted averages (the criterion scores). Table VI summarizes the results.

There seemed to be a satisfactory relationship between predicted weighted averages with criterion scores. Mathematically this was further attested to by a multiple correlation coefficient (R) of .527. The experiment would have been more satisfactory had there been more students in courses 4 and 5. Evidently the average error in both these groups was false. The average error for the 74 students taken as a complete group was 3.5 points.

TABLE IV. Intercorrelation Summary

	Criterion	*Thurstone*	*Form Board*	*Iowa Math.*	*Pressey*
Criterion		.37	.16	.50	.25
Thurstone	.17		.29	.43	.40
Form Board	.02	.15		.20	.34
Iowa Math.	.38	.22	.02		.37
Pressey	.02	.22	.25	.20	

TABLE V. Comparison of Beta Weights

Test	*Beta Weight*	*Per Cent Variation Caused in Criterion*
Iowa Mathematics	.410	65
Thurstone Arithmetic	.169	27
Pressey	.032	5
Paper Form Board	.021	3
	.632	100

TABLE VI. Comparison of Predicted Weighted Averages with Criterion Scores

Students	*Courses*	*Average Error*
	1. Metal trades and drafting	
	a. Machine-shop major	3
15	*b.* Drafting major	4
22	2. Technical electricity	3
20	3. Power engineering	3
2	4. Industrial chemistry	2
2	5. Air conditioning	5

Summary and Conclusions

The battery seemed inadequate. This inadequacy may have been caused by: (*a*) the limited number of cases; (*b*) a weakness in the criterion score; (*c*) the fact that no provision was made to survey the interest or *drive* of each student, (*d*) the brevity of the time interval. The Iowa Mathematics Training Test and the Thurstone Arithmetic Tests were definitely valuable. The value of the Pressey Test seemed negligible, as did that of the Form Board Test.

The correlations were definitely affected by the small range of talent in the group tested. The group was one that had already been classified as technical. Perhaps past grades should have been considered.

[3] Hull, Clark L., *Aptitude Testing*, p. 275.

[4] *Loc. cit.*

Application of Psychological Principles to Woodworking

*Louis L. DeGiacomo**

Woodworking is usually introduced into the school curriculum in the sixth grade, and may be continued to the conclusion of the twelfth grade. In applying the general principles of learning to the subject, no specific grade is considered, but each principle is illustrated to whatever grade affords the best example.

Nature and Definition of Learning

Learning is the development or modification of functional tendencies through activities. It is considered from a total psychological situation. A boy who studies the subject of woodworking for the first time in the formal classroom, is subject to many reactions, responses, and activities. During the progress of the subject, he develops, improves, and modifies mental and manual performances. The boy, at the start of this subject is confronted with new experiences. The shop is different from all his other classrooms. He is anxious "to do." He wants to see, feel, and use the tools. He wants to express himself. He wants to make something. He knows a bit about each tool because he probably experimented with his father's tools in the home-basement shop. By trial and error, he may have made a scooter, or a cart, or some other boyhood necessities. These experiences motivate eagerness to build.

Understanding this condition which exists in the boy, activities and performances should be developed, improved, and modified.

The boy, through perception, becomes aware of external objects. He sees the tools and gets a mental image to which he associates the proper name. He goes further as he uses the tools because he acquires sensory qualities and relationships. Consider the boy's experience with a plane. He becomes aware of this object. He associates the shape with the word "plane." As he uses the plane, he relates the name and shape with the actual function, and this gives him a mental complex or integration which has sensory experiences as its core.

This total function of using the plane has built a memory image from which he will be able to make use of when the need for planing arises. His sensory awareness to the plane, its qualities and relationships, will be remembered, and when he desires a smooth surface on a piece of wood, his memory of his early experiences will aid him. If the boy has used only the plane, he associates smooth surfaces with the functions of this tool. When a new experience arises which calls for a smooth surface under conditions not favorable to the use of this tool, his first tendency based on his past experience is to use the plane. His imagination has to be reorganized so that the past experience will be related into the new experience. The new experience may call for the use of the chisel. This tool also gives a smooth cut, similar to that made by the plane, but, the conditions under which each is used is different. The action of these two tools have established a conscious pattern to the boy, and have been correlated. The results may affect his emotions. A mental state and a strong degree of feeling will accompany this motor expression.

Inspection, searching, comprehension, and problem solving are the complex functions. These functions cannot be developed until sufficient knowledge has been acquired by the boy, in the handling of the tools, in the fundamental processes, and use of materials. Comprehension is knowledge, understanding, and applies to the complete experience of external objects; general principles in which a thought of their composition, relation, origin, and meaning is added to the direct experience. This is illustrated by the squaring-up processes used in finishing a piece of wood to a given length and width. There are six basic functions used to obtain this, and each carries the task forward to completion. The comprehension of each separate process is necessary, because it is an essential part of the whole. Each is related and meaningful and adds to the direct experience of the child. This same squaring-up process involves problem-solving thinking, because it requires intrinsic series of acts which lead to the attainment of a specific goal. The student's train of thought is directed toward finishing the piece of wood to the sizes he desires. The desire arouses his thoughts as to procedure in determining the course of ideas or operations initiated by the problem. He reflects upon his mental resources and past experiences. To lead to the conclusion he uses the six fundamental processes and motor operations in chronological order, and his result is successful.

To discuss the various kinds of modification in the functions which are brought about by learning in the subject woodworking, let us consider the first attempts of a boy who wants to make a piece of wood of a desired size, smooth on all sides. His first effort is usually to draw the rectangle on the board, saw around it, and then file or sandpaper it smooth. This effort is incorrect, and needs modification. His knowledge is not sufficient to do the job in any other way. Added features have to be introduced, and these in woodworking are the basic fundamental processes which, explained to the boy, provide the functions which will bring him success. These processes form the substitutions to his previous wrong way of doing the job. When the occasion arises again, he will respond to the new cue of "square up the piece of stock." He completely eliminated his first method and he has removed or streamlined all that is not best or essential. He integrates each of the six steps and performances, and they become knitted together into a whole. The fixation of this is accomplished after he has learned these processes. Repetition will fix the learning process, and motor drill will improve his skill.

The Principle of Maturation

The majority of woodworking teachers have concluded through studies that at the age of twelve years, the boy is physically and mentally mature for the basic processes of woodworking. At this age, he is sufficiently developed mentally to learn fundamental processes and governing rules upon which the foundation for advancement may be based. He has had sufficient knowledge in other subjects which he correlates unconsciously in acquiring the fundamental processes of woodworking. He knows an amount of reading which will enable him to follow the simple instructions, enough arithmetic to compute and measure, enough geography and history which gives him an understanding of facts used in woodworking related knowledge, etc.

Since the child is mentally mature, the greater factor for consideration is physical maturation. Woodworking is a subject of motor skills which require physical ability. Boys from 12 to 14 years of age are physically capable of skillfully using: the plane, marking gauge, rule, try square, handsaws, hammer, screw driver, and the boring tools. They are mentally mature to construct simple objects out of several pieces, which can be completed by applying the basic fundamental processes.

Boys from 14 to 18 have developed the muscular control and strength to use chisels, gouges, and routers. They have also reached the mental maturation to construct objects consisting of many assembled parts which include the more complicated joints.

From 18 years on the boy is mentally and physically ready to use the power machines. This age is determined by the state department of education. He realizes at this age the dangers of these machines and is sufficiently mature to exercise precaution, judgment, and skill.

*Boston Technical High School, Boston, Mass.

Principle of Repetition

Repetition in woodworking is inevitable because many pieces of wood must be put through the same processes, before they are ready to be assembled into a complete piece of furniture. Let us consider the operation of planing a surface. If a table is to be made, there are many pieces which have to be planed before they may be assembled. The student's first try at this operation should be directed toward success. This will give him the right attitude and will. The laws of readiness, effect, and exercise, play a great part in this learning process. If the boy is ready to plane because he has a need for it, the results must be successful or else discouragement will come, when he tries to assemble the parts. As he continues to plan other pieces he is repeating the operation frequently, and this keeps him in practice. It gives him mastery of this basic process, and it becomes fixed. This necessary repetition may be called drill. After constant use, planing becomes automatized, and the boy can perform the process by eliminating the cautions that existed at the beginning, because no more improvement is necessary. This form of repetition is good learning, because the boy performs purposeful operations on separate pieces which will later form a whole.

Varied Activity

Varied activity may be trial-and-error learning, and it is the procedure that one uses to solve an unfamiliar problem. In woodworking, there is no place for trial-and-error learning as applied to the construction of a whole object, such as a table, because there are basic fundamental processes which the boy is taught, and which lead him to the completion of a finished project. The trial and error may be resorted to by the boy, when he uses a tool, such as the plane.

He tries to plane a surface so that it is smooth, straight, and square. This provides an available situation, and he is in a mental state of readiness. He wants to plane it successfully. He pushes the plane across the board, examines the piece, distinguishes the action, and works to perfect this action. He planes, examines, and tests, and if it is not as he desires, he tries to modify his action and correct the mistake. With each try he eliminates the useless action, and notes those that lead to success. The successful actions will be repeated. Those that fail will gradually be eliminated. Successful actions will form the habits.

The Principle of Motivation

This is an individual's activity and the learning that results from it in a given external situation, and it is determined by the pattern of motivated conditions at the time. A boy in the woodworking class, has a desire to construct a finished project. He sees in the object a definite goal, and his attitude toward the work depends upon the results of his early experiences. If he has been successful in performing previous processes, his attitude toward the new work, will be one of desire to go on. His task is to make a finished object. His efforts should be guided, and praised if deserving. The outcomes should be habits conducive to good working. He learns respect for tools. Frequently he assists or asks assistance from other boys, and thus learns the value of co-operation. Good attitudes and ideals are the outcome.

The Principle of Conditioning

This is the tendency to respond in a new way to a given situation, and is developed by adding to the situation, during the period of learning, a stimulus factor which is adequate in arousing the desired response. This is a total situation with added stimulation which modifies the total function. To illustrate this, let us consider the term "square up the piece of stock to size."

A pupil has a need for a piece of 2 by 4-in. wood which will be smooth on all sides. This is what is called squaring the piece of stock to size. To do this, he will perform six basic processes which will give him the desired results. He will first find the concave side, plane a narrow surface, gauge the width, and plane to the gauge line. These three processes will give him the width. To get the length he will backsaw one end, measure the length, and backsaw to the length. This gives him the desired results, because the piece is smooth on all sides, and to size.

The boy first performs each one of these separate steps as units, and he is shown what part each plays toward the completion. He does not at first see the integration, but as he finishes all six steps the realization appears. They all become united to give a total situation. The boy has seen and performed all of these steps. He knows the results because they have been proved to him.

When the need arises again, the term "square up a piece of stock to the size you want" will substitute for the explanation of the six processes that he has to perform. He eliminates the explanation for each step, although he performs them. If the sizes of a piece are different, it does not become a distraction because during the period of explanation, he obtained the concept that where the words, *width* and *length* appeared, the new dimensions for width and length must be substituted.

The Principle of Relationship

The discovery and development of relationships contribute to the mastery of woodworking. This can be illustrated by the same six fundamental processes previously mentioned. The relationship of learning the first process directly leads to the teaching of the second process, and so on, to the sixth, because they have a "belongingness." Each, separated from the other, leads nowhere. The fact that one belongs to the other gives them a meaningful association, and fosters or promotes learning. These six processes are the "ABC's" of woodworking, and each plays the intricate part in the development of understanding. As the boy performs these functions, he sees as well as knows the part they play. The relationship of this may be carried into solving problems at home through insight. If he should meet with a situation in making some project or repairing at home, he may solve this sudden apprehension of meaning. He reasons by applying the classroom information to the problem at hand and solves it.

The Course of Improvement

In woodworking there are definite limits of improvement. If a task is given to a boy before he is ready for it, that is, physically or mentally, his progress is slow, and the results not of the best. He will advance to the point of his ability, and then stay at a plateau of stagnation. He will become fatigued and discouraged, not because he has not the ability, but because he is not ready, and his progress will fluctuate from this point. A boy in the sixth grade will suffer these effects, if he is given a manual process such as chiseling. He is not physically capable of doing this, because it requires strength. He becomes fatigued and discouraged, and in all probability the results will be poor.

Physical defects, such as, arm and leg disabilities, or malnutrition, or poor eyesight, are all factors which retard learning and proper manual functions. This subject requires physical strength as well as mental capacity, and it is obvious that these defects prohibit or retard the development of the manual skills. The boy that suffers from these effects is often excluded by the school physician.

The Development of Motor Skills

The development of motor skills make for efficiency in the boy's learning. The boy must get a clear and exact idea of what is to be done, such as, plane a surface, gauge a width, saw a board, and the like. This is his aim. He may obtain the information from an instruction sheet, printed directions, or from oral directions. Better still this may come from a teacher demonstration or from individual instructions. He has a model to go by from such instruction. He sees how the board is planed, gauged, or sawed.

The pupil participates in the setting up of the model, either by contributing toward the demonstration, or by actual participation. He asks and answers questions. He may prove before the other boys that he knows how to work with the gauge, plane, or saw.

The boy must feel a need for the skill that he is to acquire. In woodworking this is obvious to the boy, because he realizes that the process he is being shown will carry him one step further toward the completion of the object he is making.

The pupil imitates the instruction or demonstration that he has seen, and during the actual manual work, the pupil criticizes his own results. An illustration of this is the boy sawing a piece of wood.

He knows if he is sawing it on the line and is capable of criticizing his effort. Although he has seen the teacher demonstrate the process of sawing, he still resorts to trial and error to solve the difficult parts of the process. As he saws off the line, he will try various devices to get back on the line. He will discard those acts which are unsuccessful and note the actions that bring the saw back on the line.

He will continue to imitate and criticize until a greater facility for sawing is attained. After he has sawed with accuracy, he becomes satisfied and further operations of sawing aids to fix the skill. As he continues, the sawing becomes automatic, and the skill of sawing permanent.

These mentioned facts are not obvious to the boy, but are so interwoven that they develop his motor skills. The teacher, in deciding what method of teaching to use, whether inductive or deductive, has to consider the subjects before him. The teacher decides if the lesson shall be presented at one time, or whether it is to be broken up to extend over several lessons. This will depend upon what he is teaching. He must also decide how much use shall be made of actual demonstration of skill or of verbal direction.

The Development of Perception

In learning through perception, the boy becomes aware of external objects, qualities, or relations, which impinge directly upon his sensory processes. The boy in a woodworking shop is subjected to the laboratory method, and this provides him opportunities for innumerable experiences. He is not limited to textbooks, and experiences the reality rather than a book knowledge of the subject. The knowledge of the tools and the materials that he uses may be obtained through a number of the senses, and each sense contributes its own quality to the perception. He sees the tools visually, and progresses from merely identifying the tools to knowing the parts and their functions. His auditory sensations are first noises, and in time the noises take on meaning. He can distinguish sounds that come from the proper use of the tools, and those which come from improper use. Olfactory sensations or a knowledge of odor aids him to distinguish one liquid from another. He first notices that paint, alcohol, shellac, and turpentine have smells. In time he will associate the particular smell with the correct liquid. He will also know that shellac has an alcohol odor, and by reasoning will put alcohol in the shellac to thin it.

Motor sensations are illustrated by the boy's ability to measure by judgment or rule. At first the rule is just a tool to measure, but as he develops this sense, the rule takes on a different meaning. The parts of the rule become definite units. Perception plays a potent part in the learning of woodworking.

Memorizing, Rote, Verbal Learning

Sensory-motor, perceptual, and memorizing, all have something in common, but have technical differences. Memorizing is the formation of associations of ideas in which there is no meaning connecting the elements.

In woodworking, there is little use made of rote learning, unless one considers the related knowledge about the materials and tools used by the pupil. There is, in the actual functions of woodworking, meaning and belonging through logical association. The boy does learn and memorizes the names of tools and the processes of using them, but the name of the tool and the process it performs are associated. They can easily be recalled because the boy has a need for them.

Rote learning may be illustrated by the related knowledge about *alcohol*. When the student first learns about the manufacture of alcohol his interest is high, and he learns rapidly. He learn less rapidly from lessons on alcohol given later in the course. Since the first learning counts the most, the facts presented should be clear and complete. The important facts concerning alcohol should be learned carefully, and not too much should be included in the one lesson. He should learn the facts to the extent of overlearning. The whole and complete story of the manufacture and use of alcohol should be given, and the most difficult parts of the story should be explained thoroughly. Problem solving supersedes the use of rote learning in the woodworking subject.

Comprehension, the Development of Understanding and Concepts

Comprehension involves learning in many ways. It is concepts, ideas, and other phases which build up the pupil's knowledge. To illustrate this, let us consider the process of *backsawing a piece of stock*. The child knows the backsaw, and that it is used for sawing. This becomes the core to build up the simple idea. Other topics will be added to this, in order to give better comprehension. A demonstration of actual sawing is shown to the boy. He will be shown how to hold the backsaw, and to move it across the piece of wood. The saw is placed in a knife track. This guides the location of the saw. The stroke will be across the grain. This necessitates that the backsaw be a crosscut saw. The stock is held firm by a bench hook, and a try square guides the right angle cut. The boy sees all this, hears the directions, and probably contributed toward the demonstration. This constellation of ideas adds to the core *backsawing a piece of stock*, and adds to the boy's concept of this performance. This enriches his comprehension.

Development of Problem-Solving Thinking

Creative thinking is problem solving or reasoning processes. It is brought about by utilizing insight, varied activity, association, analysis, or other functions. The two general processes of reasoning are inductive and deductive thinking. Of the two, inductive is better because it begins with experiences in a problematic situation and reasons to a conclusion.

Problem-solving thinking may be used by a boy to cut a molding shape on the top of a box. Here he has a problem fraught with doubt and perplexity, yet he has a clear statement of the aim. He wants to cut this molding, but how will he do it? Thinking begins to organize itself immediately, and suggestions of possible solution come up for consideration. Can he chisel it into shape? This would be slow and inaccurate. Can he file it? This is impractical. Other suggestions come in orderly array. Each is weighed or tried, and each is cast aside. He remembers the molding plane. He has seen it and assumed that it was used for the purpose that he needs. He chooses this for the possible solution to his problem. He tries the plane and finds it to be the best thing to use. This clears his problem. The cutting of the molding brings satisfaction because he feels gratified that he was able to think out the problem of cutting the molding by himself.

Development of Emotional Reaction, Attitudes, and Ideals

Incentives are devices for stimulating attitudes. Attitudes are feeling elements or mental dispositions of one to act in a definite way. In terms of behavior, attitudes are tendencies to respond. They influence success. Emotional responses, ideals, and attitudes play a tremendous part in the direction of a child's learning, and the important task of the teacher is to bring about the education of feeling, and the training of the proper emotional responses. A passive attitude should be changed through motivation to an active attitude of determination to achieve. Sympathy, happiness, courage, and love should be brought about in the life of the classroom. The teacher should provide exercises for these emotional responses. Envy, jealousy, fear, delight in cruelty, ignorance, and disobedience must be eliminated from the classroom, and the teacher should bring about the opposing habits. Definite assignments, set objectives of achievement, information as to progress, honest rivalry, and sympathy aid to establish the attitudes of will to learn. The teacher should realize that emotional reactions, attitudes, and ideals are determiners, not only of what the child thinks and does, but also what he welcomes or rejects, according to what satisfies or annoys him. In woodworking, creative activities aid in developing all these factors, because the child is able to show achievement of personal power, his experiences are liberated, and his conscious being is unified in singleness of purpose. His whole personality is integrated in accomplishment.

In woodworking, definite assignments are given in the class. The boy knows what the aim of the lesson is, such as,

(Continued on page 64)

Industrial Arts and Vocational Education
John J. Metz, Editor

DON'T FORGET THE A.V.A. CONVENTION

The coming convention of the American Vocational Association, which is scheduled to be held at Hotel Statler, Buffalo, N. Y., on February 6, 7, 8, and 9 is of tremendous importance to all interested in industrial arts and vocational education. The main topics of discussion at all of the meetings are of special importance at this time, because they embrace the problem of the veteran, the question of training and retraining for peacetime pursuits, and the problem of that large group of young people who cannot obtain jobs until they are of almost adult age.

These questions confront educators and it is well that they be discussed on a country-wide basis so that general conclusions can be drawn, which will be of assistance to those who guide education federally, in the individual states, and in the larger and smaller communities throughout our land. The future welfare of the youth of our country is at stake, and the educational plans that are worked out and put into practice in the next few years will definitely influence the lives of our workers, employers, professional men, and politicians of the future.

That industrial arts and vocational education is an important part of the over-all picture of education in our country has been amply demonstrated during the past few years. Let us make sure that the position gained by these fields of education will not be lost in the future. As many as possible, therefore, should attend the A.V.A. convention, join in the deliberations, and take home some of the important conclusions and apply them to make their own work more worth while and effective.

THE BUDDY SYSTEM

In December, 1944, Mexico started on an aggressive campaign to eradicate illiteracy from the country. This was a gigantic undertaking, since almost half of the population can neither read nor write. Mexico's formal school system is not large enough to make much of an impression on the solution of this problem. President Manuel Avila Comacho, therefore, issued orders that extraordinary things be done to make his people literate. Short cuts had to be taken to get those who were not literate to learn how to read and write in the shortest time possible.

In the state of Chiapas, for instance, the public-school teachers, of whom there are 1500, each undertook to teach 100 illiterates a day. This means that in that state 150,000 are being assisted to get out of the illiteracy class, and those teachers are doing their part without receiving extra pay.

Business and industry, the press and radio, labor and agrarian leaders, clubs and individuals, are taking part in this gigantic program of education and money is spent freely to make it successful. Probably the most spectacular, if not the most successful scheme, is the "Each-one-teach-one" system that has been inaugurated, in which neighbor teaches neighbor, and friend tutors friend. To make this system as effective as possible, the Mexican Government has distributed millions of free copies of an expertly devised, simple primer. It is claimed that the average sound-minded illiterate can master a lesson from this primer in about one-half hour.

When it is considered that approximately two million of Mexico's Indians cannot speak Spanish, and that only about one half of the illiterates over 60 years of age can profit by the instructions, it is easy to see what our southern neighbor is trying to accomplish.

Can we in our schools, academic classes as well as shops and laboratories, try out and probably benefit by this same system? There are always students who are in the failure zone in their schoolwork. Can we work out aids so that one friend can efficiently help another who does not grasp the subject matter as rapidly as is expected of him? Of course, the factor of making the lazy still lazier, or of training the slow student to depend more and more on a helper must be guarded against. That is a matter that must be worked out.

Shop teachers already have experienced the benefits of training students to assist in some phase of the teaching problem as shop superintendents, foremen, safety engineers, record clerks, tool- and stockroom attendants, and the like. An extention of this pupil-personnel idea would be needed to work out an efficient method of getting better students to pair up with the weaker learners in order to give every pupil in the class a real chance at mastering the subject taught.

The idea underlying this system is sound, too. The boy who has little or no trouble in grasping the teacher's explanations, is much closer to the student who is not able to comprehend the lesson; hence, it may be easier for him to adapt his explanations to the other boy's understanding than the instructor is able to do.

Mexico's system is not new, but it bears investigation and further study in our own classrooms. It should be especially valuable in classes where mathematics and science are taught, and it would not be out of place in many situations that arise in the school shop.

AN OPPORTUNITY

Many of our returning soldiers are quite anxious to take up college work. Some of them are not so sure about what they want to do after they have finished their schooling. They need a great deal of educational and vocational guidance. They have been through some grueling experiences, they have seen other countries, and have witnessed how people of other nationalities live, but that does not mean that they have any clearer notion of what they will do with their own lives after they have been dismissed from the army.

There is a dearth of good shop teachers, and the present situation offers a fine opportunity for interesting some of these fine young men to take up teaching as their life's work. They will have a great advantage in their favor right from the start and that is the regard all boys have for the soldier. Once having this regard, half the battle is won, and both the boys and the soldier-teacher will find it easy to work together.

Those engaged in industrial arts and vocational education ought to see this opportunity clearly, and they should act at once. Among the returning veterans there is excellent material and the teaching profession ought to get the cream of it.

THE MODERN EPIC

The true epic of our time is not "arms and the man," but "tools and the man," an infinitely wider kind of epic.

— Thomas Carlyle.

(Continued from page 62)

finding the concave side, etc., and he knows what his objective of achievement is. The small part, that he is working on at the present, will in time become part of his completed piece of construction. He is self-informed as to the progress he is making, because he knows to what degree he has advanced toward the completion of his object. When the boy meets an obstacle in the learning of the subject, the teacher directs, inductively or deductively, the learning process. To guide the boy, a finished model or a pictorial drawing of the object he is making is before him. This aids in his comparing his own progress and quality of work with the model. It helps to keep the boy's interest, and presents a standard to him. Incidental informal lessons also aid him. If one boy is slower than the other, either because of maturation or mental ability or other factors, the teacher should respect the individual differences. This is also true when the child is measured or tested from time to time. The teacher should be understanding and fair, and should think of the individual child alone. The boy must recognize and appreciate the teacher's skill and take note of the enjoyment and pleasure that he has in working with the pupils. The woodworking teacher should give sincere statements as to fact, and also to the boy's success with the work. They should be constructive statements and such that they will improve the habits the child is acquiring. From time to time the boy should be shown, or brought to see pieces of furniture that are models. He should also see the men working on these models in the factory. This develops his standards. During the course of the woodworking periods, intellectual outcomes, standards of conduct, courtesy, tact, truthfulness are indirectly pursued, and accuracy, persistence, neatness, and general direct habits are the outcomes to be expected from the boy who constructs in the woodworking shop.

It Isn't So!

*Hyman Goldstein**

With the increasing emphasis on vocational guidance and vocational analysis, many misconceptions and fallacies in the popular mind regarding occupations and employment have come to a sharper focus as a result of the new light thrown on the subject by scientific study. These fallacies are, in general, rather naïve. That they have been held for years and accepted as gospel truth makes them not less but more deplorable. Some of them will be discussed in this article. For many, many years it has been fashionable to believe:

1. That all that one needs for success in certain occupations is general training in the old, stand-by virtues of honesty, reliability, punctuality, and courtesy in addition to a firsthand knowledge of the social graces. It is true that all of these are important in job placement and promotion, but these alone are not salable nor are they recipes for success. Honesty by itself may be the best policy, but it is not a trade and punctuality is neither an ability nor a skill. People are not hired just because they are courteous or just because they are dependable but rather because they can run a lathe or operate a linotype machine or manipulate a mimeograph. For permanent success the so-called virtues must be accompanied by specific skills that require definite training.

2. That work depends more on skill than anything else. If this were true, then it would necessarily follow that all people who are fired lack the necessary skills. The truth, however, is that about 65 per cent of employees discharged in normal times are dismissed for personality disturbances and emotional disorders in no large way connected with intellectual unfitness or lack of necessary skill or training. Laziness, negligence, and general indifference to one's work are potent causes of pink slips in pay envelopes and they may bear little if any relation to the inherent ability or skill of the worker. It has been found that work is a habit of mind. Just as some people are primarily the workers in our society, others are primarily the drones. Some think in terms of working, others in terms of idling.

3. That people should be hired because they need jobs. This fallacy is, of course, all the more prevalent because of the rather abnormal business conditions of the depression years. There is no connection between the need of the applicant and his efficiency and working abilities, because no man is fitted or unfitted for a job solely on the basis of his economic condition. The employer is interested mainly in securing the most skillful and most efficient help irrespective of job need. The ability of the applicant is and should be the only criterion.

4. That entrance upon a given occupation is quite often absolutely prohibited by the possession of different types of handicaps. Nothing is further from the truth! With the exception of certain physical handicaps, such as lack of eyesight, hearing, etc., which are obviously disabling in certain types of work there are few handicaps which an individual with adequate intelligence and an interest in his work cannot overcome.

5. That employers draw an age limit in hiring employees. It is true that certain shortsighted firms have let the worker's chronological age obstruct their vision of his usefulness and efficiency. But in the great majority of cases good workers are allowed to keep on working until their efficiency diminishes. They have no real age limit but rather a limit of decreased effectiveness beyond which they may not go. Henry Ford has found that his older employees are among his most useful ones. Their many years of experience cannot be successfully replaced by the greater energy of untried youth. When a worker becomes "moth eaten" and dead on the job it is time to replace him by somebody more able. This matter of being old on the job should have no relationship to one's age in years. It is, however, related to effort. People are old when they cease to try—and not before.

6. That getting a college education is a sure-fire guarantee of vocational success. There is little in life that is sure fire and certainly success in occupational life cannot be predicted merely by the possession of a sheepskin. More than that enters into job placement and advancement as any recent graduate can verify. The factors of perseverance, interest, ambition, sincerity, sociability, and many others, are very important in this business of getting ahead. They vary in number and in degree from individual to individual. They are not acquired automatically by attendance at college nor are they the exclusive monopoly of those who elect to go to college.

7. That working one's way through college is extremely desirable from all points of view. Working one's way through is not always the character stimulant that it is supposed to be. Often it is the destroyer of health. Many cases of students are known who ruined their health needlessly by desiring to apply themselves to the double burden of school and work although they were under no constraint or obligation to do so. Believe it or not, this double burden is a tough assignment for young bodies and, at times, a questionable heroism. It is difficult to carry on two major activities at the same time without messing up one or both of them. Wherever possible, a full-time application to the problems of studies and school is preferable for effective living as well as for effective learning. For the needy able and deserving, loans, fellowships, and scholarships have been established at most colleges to permit this full-time application.

8. That there is a shortage of work in industry. There is just as much work as ever, if not more, to be done to supply the world's needs. However, the matter of

*Psychologist, New York State Vocational Institution, West Coxsackie, N. Y.

work differs from the matter of jobs. The latter depends to a great extent upon economic conditions, the rise and fall of stocks on the exchange, and other factors which determine how much money is available for labor to do the work and, thus, how many men can be carried on the pay roll, but not necessarily how much work there is to be done.

9. That certain occupations are so badly overcrowded that it is impossible for anyone to enter them. It is true that certain trades and professions, such as medicine and law, appear to be overcrowded—but not with men of outstanding ability and skill. There is always room in any occupation, even at the top, for individuals of ability and determination. If a person has what it takes, nothing will stop him, come depression or what may. If you can make mousetraps better than the next fellow you will always have a job, even in a world full of mousetrap makers.

10. That opportunity is limited in industry today. There is no more truth in this fallacy at the present time than there ever was. Opportunities are made or created. They are rarely ever presented on a silver platter. And today opportunities are greater than ever before because not only is it possible for men of outstanding abilities to create their jobs but to advance at their own pace in any chosen field. The world cries out for leadership and initiative. Employment managers are driven to distraction trying to find high quality for the executive positions. Thousands of men are available for the $20-a-week positions, but vacancies calling for salaries of $10,000 a year remain unfilled because of a dearth of applicants. As Walter B. Pitkin says in his *Psychology of Achievement*, "There has always been room at the top. Nowadays there is a vacuum there."

11. That machines are fundamentally the cause of unemployment. Some people would even blame the machine for all of our economic ills. However, a study of population increase as compared to increase of gainful workers according to the census figures obtained from 1870 to 1930 (the period of the greatest development of the machine) by the National Industrial Conference Board reveals some startling facts. While the population increased about 218 per cent, those engaged in gainful occupations increased about 290 per cent. What does this mean? It means that the substitution of machines for hand labor not only made work lighter and easier, not only increased the free time of millions of individuals, but also gave more employment to people. The machine is both destroyer and creator. It may take away jobs with one hand, but it gives twice as many back with the other. One million jobs directly or indirectly concerned with the old-time horse-and-buggy business of grandfather's day have been replaced by about 6,000,000 jobs that are concerned with manufacturing, advertising, selling, and servicing the automobile of today.

12. That the majority of the nation's workers are employed in factories. The truth is that about 85 per cent of the gainfully employed work in nonmanufacturing occupations whereas only about 15 per cent of them actually find work in the manufacturing industries. Even where the machine has brought an influx of new jobs the vast majority of these new occupations are not primarily concerned with the actual manufacturing process but rather with the advertising, shipping, selling, and repairing of the manufactured item.

13. That the major consideration to be taken into account in selecting an occupation is the actual or potential income that may be expected. This fallacy is in error in more ways than one. First of all, few people have more than a vague idea of what they may look forward to in the way of earnings and even then it is more than likely to be off the mark. It has been shown that, in general, students have fabulous notions pertaining to the average incomes of the occupations which they intend to enter. For instance, whereas the average income of physicians throughout the United States may be between $1,500 and $2,000 per year, at a certain college, students who anticipated medicine as a career believed that, as physicians, they would earn between $6,000 and $8,000 per year. Even if their notions regarding income were more accurate there are still more desirable considerations than money which should have greater weight in the determination of a life occupation. Some of these factors are self-expression, culture, social contribution, and service. Just think how satisfying is the knowledge that one's job is not only a medium of self-expression, be it mental, physical, or emotional, but that it is also one's unique and individual way of unselfishly serving one's fellow man.

14. That an *easy* way of making a living is to select a professional occupation. As a matter of fact, the more professional the occupation, the more strenuous and engaging it is. It requires a keen mind, a strong constitution, an unflagging interest, and an indomitable will to overcome innumerable problems. A professional man has no hours. He is always at the beck and call of those who are in need of his services whether they be spiritual, medical, legal, or what not. The problems that he meets are usually not locked up in a desk at five o'clock. The professional man who is really interested in and fitted for his work lives, eats, and sleeps his occupation. It consumes almost every minute of his waking time and presumably a good deal of his sleeping time. No, professional life is definitely not *easy*.

15. That the only and surest way to reach the top is to begin at the bottom. The bottom may be a good place to start from but so is the second or the third floor. Where an individual begins should depend not so much on custom and tradition but upon his own particular make-up and set of abilities. There is no mystical potency or absolute guarantee to success about the bottom that should make it eminently desirable. The bottom does not make reaching the top any more certain than does an inquisitive nose or a high forehead or even a high intelligence. Where one starts is not important. Where one finishes is. Success does and always will depend more upon the individual than upon his jumping-off point.

16. That there are many blind alley jobs in industry. The blind alleys do not exist in the job but rather in the mind of the worker. Any job may be made into a steppingstone by industrious and conscientious work or it may be relegated to the limbo of maze traps by a careless and hang-it-all indifference. A job, like a lifetime, can be anything you make it. In any job there is room for further development, for constructive achievement, for less fatigue, for more efficiency, and for a greater degree of working happiness. Blind alleys exist only where there is no vision. Every job leads somewhere. An ambitious, discerning worker will find that somewhere quickly.

17. That jobs resemble pigeonholes in that they are to be filled and stayed filled. Jobs are no more to be considered pigeonholes than are individuals to be labeled steam fitters, book binders, or cabinetmakers at birth. Jobs change and grow with the trend of the times. The job of the auto mechanic of today is considerably different from that of twenty years ago in its scope and duties. The worker, too, must grow if he would not be forgotten. It is easy to get into and stay in a rut in any job but that is the fault of the individual and not the job. New developments, new theories, new practical applications must continually be learned and adopted if the job is not to leave us behind. It might be well to remember what George Horace Lorimer said in his "Letters of a Self-Made Merchant to His Son," " . . . when a fellow whines that he's been held down, the truth is, as a general thing, that other people can't hold him up. He just picks out a nice spot, stretches out flat on his back, and yells that some heartless brute has knocked him down and is sitting on his chest." Nothing will ever take the place of individual initiative in this matter of growth on the job.

18. That an individual is fitted by intelligence and abilities for only one type of work. The job is not a rigid pigeonhole, neither is the individual an inflexible peg. Only about one per cent of the world's population have such peculiar talents that they are fitted for only a specific vocation. The rest of us poor mortals have, fortunately, many-sided work natures. When we have to we can do many things well and with equal success. The man who can operate an elevator can also operate a cash register, a truck, and even a cement mixer. It does not mean, however, that he would like all of them equally well nor does it mean that he has no special interests and abilities. It means merely that, under certain circumstances which necessitated mov-

ing from one job to another in order to earn a living, the average individual could adjust himself to different occupations because of his very adaptable nature. This amorphousness of human abilities and aptitudes allows them to flow with equal facility into the molds of different vocations. This is perhaps the one feature that has kept the ranks of the unemployed from swelling to still greater numbers during depression years. Of course, there are exceptions and limitations. We do not expect the hosiery salesman to step into the shoes of the research chemist nor do we logically feel that a college teacher will be at ease while hitched up to a street cleaning brush. However, for proper execution of a job it often appears that the lack of certain traits or abilities is as important as the possession of others. It has been found, for instance, that a high intelligence in department store clerks tends to make them inefficient, possibly because of lack of interest or challenge in their work. They show a greater labor turnover than their less intelligent co-workers. Here, it seems, high intelligence is a detriment. Another interesting finding is that for some work one must not have too many abilities nor even the required abilities in too great a degree. Can you imagine Dr. Samuel Johnson teaching English to grammar school pupils or Whistler painting picture post cards for a living or Marconi behind the radio counter in a department store?

19. That it augurs ill to change one's occupation. Since occupations are usually chosen on the basis of individual fancy, parental pressure, imitation of one's friends or other illogical reasons that have no particular relation to the make-up of the person who selects the vocation, it stands to reason that when the mistake in choice is discovered, even if it is years after the entry into the occupation, the best thing to do is to change the work as quickly and as feasibly as possible. Too often vocational maladjustments lie at the root of psychiatric disorders and emotional disturbances. They often help to ruin health as well as happiness. The dissatisfied worker is cranky and ill-tempered at home and at work. The denial of emotional outlets and job satisfactions makes him so.

Vocational Photography

*Richard H. Behrens**

Photography has long been a prime high-school club activity. School publications of over forty years ago often contain pictures taken by the members of these clubs with the slow glass-negatives and printed on the sun-exposed papers of that day.

Improvements in photographic technology during the first two decades of this century were gradual and the applications to various fields was not extensive enough to justify the wide inclusion of this subject into the regular high-school curriculum. With the rapid improvements in photographic films and papers, darkroom equipment and good inexpensive cameras during the past twenty-five years, many of the arts and sciences have adopted photography in the regular course of study in the high school.

The change from club photography to regular course status has resulted in a strong carry-over of the hobby objective into the class work. The need for more emphasis on the vocational aspects of photography is becoming more and more evident from the greatly increasing applications which the art is finding in all fields of human activity.

In some occupations photography has become an indispensable skill. A classic example is found in the use of X-ray photography in medicine and dentistry. No one will question the importance of X-ray photography to the physician or to the dentist as a diagnostic tool. The research worker, the investigator and the reporter are making increasing use of photography because of the faithfulness with which it records graphic facts. No longer must the microscopist with little drawing skill spend long painful hours at drawing the picture he sees under his eyepiece. In a few minutes, by use of camera, film, and filters he is able to record with the utmost accuracy the picture he saw, and for that matter, often much which the eye cannot detect. This is particularly true of pictures secured in magnifications as high as 100,000 times by means of the electron microscope. The image obtained by the use of this instrument may be recorded on the photographic emulsion or may be rendered visible through the use of a fluorescent screen.

Since examples of the use of photography in occupations are so extensive, much space would be required to enumerate them. Among the few examples which will be discussed is that of the use of photographic teaching aids by the teacher. The extensive use of projected slides, motion pictures, paper prints, and the like, as visual aids has justified the issuance of an immense number of motion pictures and slides by various educational and industrial agencies and the establishment of governmental, state and local agencies for their distribution. Many teachers have made their teaching task lighter by supplementing these aids with slides, pictures, and motion pictures made by themselves.

Military applications of photography are so extensive that the mere mention of V-mail photographed on motion picture film, aerial photographic reconnaissance, and the work of the photographic services in photographing all phases of armed action suffices to indicate the indispensable character of photography in the conduct of the war.

The use of photography in the fields of research and applied science is extremely extensive. Large volumes dealing solely with the applications of photography to a specific field of scientific work have been published. So important to the biological field of science has photography proved that the Biological Photographic Association publishes its quarterly journal "for the further study of photography in relation to the biological sciences and to improve its technic." The metallurgist, the chemist, and the engineer are becoming increasingly dependent upon macro-, micro-, and X-ray photography to record the intimate structure of the materials with which they deal. It is no longer necessary for the engineer to spend long months of hardship in surveying the wilderness when a few hours flight with an aerial camera will yield pictures which may be quickly converted into topographical maps of unimpeachable accuracy. Medical students who have been dependent upon direct observation of surgical operations from unfavorable angles may now be shown, through the medium of Kodachrome motion pictures, the most intimate details of the operation in color. The astronomer finds photography absolutely indispensable for recording the characteristics of heavenly bodies which may often be seen only for a short time only to disappear from human sight for generations. The archeologist, the ethnologist, and the explorer are becoming increasingly dependent upon the camera for recording their finds.

The businessman is using photography increasingly to present to his customers visually what he may find difficut to convey through the medium of speech.

Advertising and news agencies are making capital of the fact that psychologists have found 85 per cent of man's information coming through his eyes and are printing more pictures and less text. The huge success of the various picture magazines and papers bears witness to the importance of the picture to the news reporter. The extensive use of photographs in advertisements, both black and white and those made in color from original color photographs, show that the advertiser recognizes the importance of photography as a medium.

The librarian is being called upon more and more to use photography in its many ramifications to render his stock in trade increasingly available to the public he serves. The photography of printed material on miniature film strips and the em-

*Berkeley, Calif.

ployment of these films in special individual viewing devices is coming into increasing use in libraries. Not only do microfilm copies extend the use of scarce and hard-to-get material to a wider circle of readers, but it cuts down materially the space needed to store books; a matter of no little importance in the larger libraries. Photostatic copies of printed material have long been used by libraries for widening the use of texts of which only limited numbers are available. Dexigraphing, a photographic procedure for duplicating catalogue cards is being increasingly used in libraries to economize on time consumed in copying typewritten cards with the result that greater precision is achieved in less time. Although many of the larger libraries possess special photographic units, the smaller library, through a member of its staff trained in the fundamentals of photography may do much to increase the service of the library to its public.

Law enforcement agencies are making extensive use of photography in all of its ramifications. All phases of photography are utilized in the detection and prevention of crime. Motion pictures based on traffic problems and used by law enforcement agencies have been an important phase of safety education. In the field of crime detection the photography of burned documents with ultraviolet or infra-red light is often used to detect handwriting and blood stains on paper which had been burned. Photographs of the scene of a crime or accident are often introduced into court evidence. Many police departments provide their investigators with cameras with which to record data photographically.

A discussion of the manifold applications of photography to every phase of human endeavor could be carried out for many pages. Those mentioned are designed to point to the obvious value of a knowledge of and some skill in photography as a supplemental vocational preparation for students who have developed definite vocational interests in the secondary school. An intelligent knowledge of photography, even though the worker may never be called upon to employ it, must be looked upon as a definite vocational asset. A librarian who takes a position in a large library may find that a photographer is assigned to take care of all the photographc work in that institution. Although no direct photographic skill is demanded of this librarian, the appreciation of the possibilities of photography must be looked upon as a definite vocational asset.

Fig. 2. Cross section of an electric weld

The secondary school is in a favorable position to play a vital part in developing the basic photographic skill and knowledge which the student may need in his future vocation. All that is necessary is that classes in photography be established, and that students, who have already developed definite vocational direction, be counseled to enroll in such courses. These courses are of particular value to the science and engineering student who otherwise must gain his skill and knowledge incidental to the work in the field or in the laboratory of some higher institution.

Fundamental photographic skills and knowledge common to any type of photographic work must form the core of a photography course regardless of specific objectives. This must include such basic studies as the construction and purpose of each part of the camera, characteristics of photographic lenses and shutters, the properties of photographic emulsions, exposure of film and paper, development of films, and the production of contact and projection prints.

The student who is interested in some specific field of applied photography will find motivation in projects involving his special interest. Such projects enable the teacher to provide the repetitive exercises in the fundamental processes such as those of selection of the film, use of filters, exposure, development of the film and the subsequent production of prints or slides. The student gains thereby not only the basic photographic knowledge and skill but specific experience in a field directly related to his interests.

The considerable range of photographic interests which might be represented by a class of students working at a variety of projects might seem to imply that a wide variety of photographic equipment may be needed to carry out the proper experiments. Those interested in some form of microphotography would require some form of special equipment; others might require a camera with special lenses to take pictures of plant specimens in magnifications of several diameters. These needs can be met by means of combinations of attachments to view cameras, the interchange of lenses of different focal length, etc. Such attachments and supplementary equipment are often easily made by the student or they may often be made in the school shops. The extensive popular photographic literature contains great numbers of suggestions and specific directions for the making and use of attachments to cameras for every conceivable purpose.

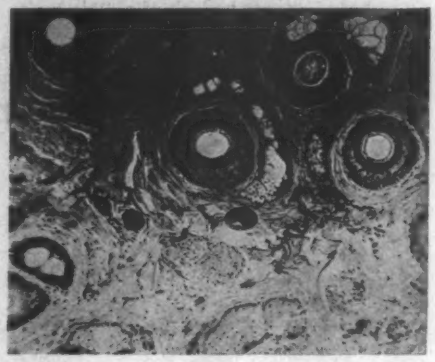


Fig. 3. Microphotograph of a scalp section

Typical examples of the many possibilities of providing equipment for the use of students with supplemental vocational photographic interests may be cited in the case of the student who wished to enter the field of metallography, another the medical school, and still another who was interested in plant pathology. The first of these wished to photograph a cross-sectioned, etched electric weld. In order to utilize the view-type camera available he designed and had made in the school cabinet shop a box extension to the back of this camera which enabled him to secure pictures magnified about 5 times the original size. This piece of equipment and the picture of the cross-sectioned weld made with this extension is shown in Figures 1 and 2. This same extension enabled a student with interests in plant pathology to make macrophotographs of plant specimens. The student who was going into the premedical course was able to secure the microphotograph of a scalp section in Figure 3 by means of the same view camera attached to a microscope by means of a simple metal collar made in the school machine shop and held in position by means of clamps on a heavy laboratory stand.

These examples are typical. Such projects, while not providing experience with the convenience and refinement of operation obtainable with costly special photographic equipment still equip the student with the fundamental knowledge and skills involved in the photography inherent in the occupational field which he may be planning to enter.

Fig. 1. Camera equipped with extension for making enlargements

"Little Business" and the Part-Time Co-operative Program

*Snyder B. Keathley**

In the November, 1945, issue of *Industrial Arts and Vocational Education*, there appeared an article entitled "Industry and the Part-Time Co-operative Program." In that article, the writer explained that he had conducted a survey to determine the reason for the growth and popularity of the diversified occupations program, or *D. O.* program, as it is often called in Tennessee.

The survey covered four distinct fields. *Big Business*, or industry; *Little Business*, or the major portion of the employers of co-op, part-time students; the school; and the boys and girls who have participated in the program. Following the earlier article on *Big Business* and what it thinks about the diversified occupations program, the writer wants to present the thinking of the men who employ the student learners and in many cases personally train them.

J. B. White, owner and operator of the Remine Memorial Co., Greeneville, Tenn., who has trained a high-school boy as a memorial craftsman states:

> As a former school man I have been interested in this type of education for many years. In my mind practical education has been neglected in favor of academic training. A livelihood is of primary importance. No one is completely educated unless he can use his hands as well as his head.
>
> The D. O. program enables the pupil to acquire the skills of an occupation at a period of life when it is much easier to learn. By settling down to business early in life, youth can conserve the precious years of life which would otherwise be spent in aimless drifting about. For these reasons I heartily endorse the program.

Mr. White's business is located in the shadow of President Andrew Johnson's old home, and the famous tailor shop is just around the corner. Certainly an inspiration to the young craftsman-to-be.

F. C. Wayland of the Greeneville J. C. Penney Company's Store, mentions the high school student for whom the D. O. program is primarily intended when he says:

> It is my honest opinion, for students who do not intend to enter college, it is the most important course offered in secondary schools today. It has been my experience that the vocational students are far more efficient than those who have not had this type of training. I fully endorse this program and recommend it to all types of businesses which are in position to use these part-time students.

Even though the co-op program is designed primarily to meet the needs of the boy or girl who is not going to college, some graduates do go to college.

L. Morgan Smith, Commercial Manager for Graybar Electric Company, Chattanooga, in a letter to the Central High School co-ordinator, combines the "go on to college" idea with the fact that most D. O. student learners improve their scholastic standing after entry into the program. Mr. Smith writes:

> Having worked one of your students for two years I found that by co-ordinating the student's schoolwork with his prospective occupation we were able to get a passing student to make the star honor roll. By reporting at school on his work with us you have made him more conscious of his duties to his employer. We were able to convince this student that he should and could have a college education. By saving the money he made while in high school he was able to begin his college education.
>
> It is my belief that having had his high-school work co-ordinated with that of his prospective future work will make his college education a game in which he will be able to pick those things in college which he will most need.

Delores F. Moore, Chief Dietitian at Meharry Medical College, famous Negro school in Nashville, comments on a student learner from Nashville's largest Negro school, Pearl Senior High School. She writes:

> I am sufficiently satisfied with the caliber of work this student has performed to offer her part-time employment while she embarks on her college career. This part-time position could subsequently lead to a full-time position upon completing the academic requirements if the student so desires.

An advantage of the smaller shop as a training agency is expressed by G. T. Foust, Vice-President of the Clarksville Foundry and Machine Works, Clarksville, Tenn., as he speaks concerning his experience with the part-time co-op program. He says:

> All of the half-dozen students placed with us for part-time training have been of a very high type, alert, industrious, and capable. Everyone of them has made us a valued employee.
>
> This combination of work and study has enabled the boys to see the practical applications of the things they study. Trained, as they were, in a small shop, they are given a wide range of experience, both with machinery and hand tools.

A large percentage of graduates from co-op programs continue as regular employees in the businesses in which they trained. This is a healthy situation and Gordon Powell, Manager of W. L. Bently's Store, LaFollette, Tenn., reflected the program's success in this when he wrote: "It (the D. O. program) gives me an opportunity to train the student in my particular business in the particular methods of my store."

Along the same line of thought A. B. Lyle, President of Chattanooga Machinery Co., expresses himself as follows:

> We benefited from this program because it provided a source of better trained and more intelligent employees, and these students were doing their part in the war effort as they assisted us in completing our war contracts.
>
> Our experience in employing students in the part-time trade-training program has been very satisfactory and we have been very fortunate in being able to select from high type students, those who have been willing and anxious to learn.

A similar idea, uniquely stated, appears in a letter from H. G. Nelson, Superintendent of a Chattanooga business which has been an excellent training agency over a long period of years. He writes:

> Industry must have a continuous supply of raw material to survive. The day is gone when industry views as its most important raw material that which it receives in carloads. Today we accept the young employee as the most important raw material. One, which, if properly handled, guided and encouraged, makes the difference between a successful and a mediocre establishment.

The owner and editor of the *Lenoir City News*, Lenoir City, Tenn., Virgil L. Adams, emphasizes the part played by the co-ordinator in his daily visits with the employers and student learners on the job. Mr. Adams says:

> The D. O. program appeals to me as being something new and progressive in the field of high-school education and in my case it has proved quite successful. One distinct advantage of the program is that the students learn exactly what they need to succeed at the trade.

Mr. Adam's reference to the learning of "what is needed to succeed" emphasizes that vital activity of the co-ordinator which is called "co-ordination." He visits the employers regularly and plans the related study to meet the needs of the student learner as he progresses from one phase of his job learning to another. With the employer-co-ordinator team alert, the student learner's time will be utilized to the greatest possible advantage.

The development of that employer-co-ordinator team is expressed in the confidence which the employer places in the co-ordinator. One example of this is illus-

*District Supervisor T. and I. Education, Vocational Education Division, Tennessee State Department of Education, Nashville, Tenn.

trated in a letter from J. B. Miller, of Perkins and Miller, Seeds, Fence, and Farm Implements, Clarksville, Tenn. Mr. Miller, in writing to the Clarksville co-ordinator, stated:

> We have never told you in a letter before just how much we appreciate the service you have rendered in furnishing us our prospective employees. You haven't sent us a bad one yet.

It is no accident that the student learners "click." The co-ordinator recognizes that proper selection is the keystone of the program, and assures himself from many sources that the prospective student learner is sincere in his desire to learn a specific occupation; that he will benefit from the training; that his past record indicates, or that his capabilities are such, that he can carry the load of trade training and schoolwork.

Throwing more emphasis on selection is R. H. Davis, General Manager of Liddon-White Truck Division, Nashville. In expressing his opinion, he states:

> In the first place it occurs to me that you have done an exceptional job in the selection of this particular student for this type of work, since he has not only shown an unusual aptitude for the work that he is doing for us, but the progress that he has made from month to month under the combined direction and instruction of your program and our firm has enabled him to be of far more value as an employee than the average man that we could employ.

The result of proper selection of student learners is definitely pointed out in a letter from R. C. Roberts, President of the Roberts Electric Company, Inc., Nashville, when he writes:

> It has always been necessary for us to break in and train mechanics, and we have found that the young men you have sent us, are without exception intelligent, hard working and eager to learn. We don't hesitate to employ them because we know they are intensely interested in their work and have a desire to improve themselves.

The position which the D. O. program is assuming in our secondary schools is emphasized by a statement from Wilford Thweatt, Humboldt, Tenn., merchant. He says:

> I consider the D. O. program the most important phase of the training that the high school student gets. It enables the student to get acquainted with the ins-and-outs and ups-and-downs before he starts a business of his own. In this way his training is practical, tangible and to the point in everyday dealings.

David Reynolds, Cashier of the Peoples National Bank, LaFollette, substantiated Mr. Thweatt when he wrote:

> I do not know of anything connected with the schools that serves a better purpose in giving training to our young people for the thing they wish to do after they have finished school.

A delightful custom of long standing in Tennessee's D. O. program is a banquet, or dinner, with which the student learners of each program annually entertain their employers. The boys and girls plan the affair and usually prepare an interesting program for the occasion. The employers are the guests of the student learners, and invariably a closer relationship between the student learners and their employers is fostered, a better understanding of the vocational training program is gained by all concerned, and closer knit relationships between the schools and business are developed. Following one of these annual banquets Harvey Eastman, Superintendent of the Bristol Mills of the American Thread Co., wrote the co-ordinator as follows:

> I certainly enjoyed the get-together held at the Colonial Grill last Thursday evening.
>
> These students have not only been outstanding on their respective jobs but they have shown an ability to get along with people. It has been my experience that individuals who combine their schoolwork with industrial or business activities leave school with success almost guaranteed.
>
> I hope that this program will continue to flourish. We will be glad to co-operate with you on the program whenever possible. I would like to suggest that the employers and D. O. students have banquets or get-togethers a little more frequently than in the past. It would be my suggestion that the employers plan and pay for the next party.

This is expressive of the fine attitude of *Small Business* in Tennessee toward the D. O. program. It is a healthy, friendly attitude which lends so much strength to trade training on the secondary level.

Small Business affords many of the finest training agencies for D. O. student learners, and it will employ many high school graduates. *Small Business* likes the part-time, co-operative trade and industrial training program in diversified occupations.

Applied Subjects—Shop English

*R. T. Craigo**

Members of the day school instructional staff are now embarking on a new voyage which always confronts us with a challenge.

Lest we be classed with Columbus who it is said: "Didn't know where he was going when he started; didn't know where he was when he got there; and didn't know where he had been when he got back," some suggestions, comments, guides, points of the compass, and the like, will be offered in a spirit of co-operation to help develop and improve our instruction in applied subjects.

As was previously pointed out, instructors working with department heads should allocate the periods per month, or week, between practical English, shop arithmetic, shop drawing, and blueprint reading, placing the emphasis according to the needs of each operation or month's work.

*Assistant Director, The William Hood Dunwoody Industrial Institute, Minneapolis, Minn.

An applied subjects skeleton outline (instructors' guide) will be developed showing the breakdown of material included and the recommended time per month to be devoted to each phase of the applied instruction.

Objective: To help the staff answer the question—"What Kind of English is Shop English?"

At the very start of our voyage it is well for all to keep in mind the following very important facts:

1. English is a "tool." The work of the world in every line of activity calls for the use of this tool. When the workman *reads* a blueprint, wiring diagram, or layout; when the foreman *tells* the workman what to do; when the mechanic *writes* out a job or material ticket; the above-mentioned *tool* (English) is being used.

All of us should learn to use the tool (English), keeping in mind that: talking, reading, and writing are, after all is said and done, only "English."

Possibly the following somewhat meticulous phrase is worth keeping in mind:

"Familiarity with the connotation of a technical term implies ability to *pronounce* and *spell* it correctly and to *define* and *use* it properly in sentences."

In other words, your students should be taught how to *pronounce* all trade terms correctly, *spell* all trade terms correctly, and to *define* and *use* all trade terms properly in sentences.

What Is to Be Done:

Collect and prepare the following basic applied English instruction material:

1. For each department there will be prepared sheets listing in Column I—trade terms; in Column II—definitions; and in Column III—uses.

For example: Micrometer—measuring tool—for accurately measuring to a thousandth or ten-thousandth of an inch. Copper—one of the basic metals—on account of its low resistance, it is used for carrying electric current.

The preceding statement is not new! For many years all departments have prepared and used lists of trade terms. It will be noted, however, that this is to be expanded so as to include the three items: *trade terms, definitions, uses.*

In succeeding paragraphs will be given some suggestions which it is believed will be of value to all of our shop instructors who should now give considerable additional attention to shop English as applied to their specific department.

Shop English — Organization

Objectives: To help students improve their ability to *read, write,* and *talk* SHOP ENGLISH.

(1) To understandingly *read trade knowledge.*

(2) To more intelligently and clearly *talk trade knowledge.*

(3) To *write* more legibly and clearly on *trade knowledge.*

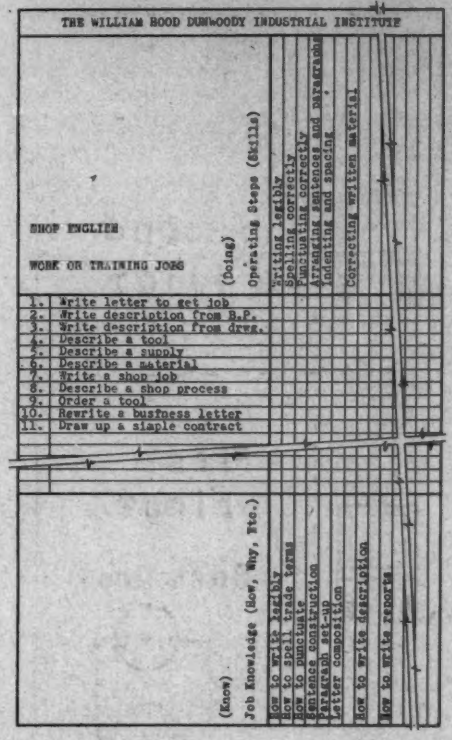
The following suggestions are submitted for the teacher's consideration:

How to Put It Across:

Select and use devices for reading and talking:

Tool checks, job sheets, job reports, trade knowledge sheets, manufacturing catalogs, manufacturers' instruction books and leaflets.

For Writing: Job reports, business letters, contracts, specifications, blueprints, trade knowledge sheets, materials, tools, processes.



Job analysis for shop English

Operation

Reading and Talking (Discussing):

Use devices previously listed.

Illustration: Ask members of the class to read from manufacturers' catalogs, leaflets, or instruction manuals a few sentences or a paragraph, and then repeat them in their *own words.*

Use *job sheets* in same way.

Writing:

Illustration: Have all members of class write a description of a *tool.* First paragraph, *what it is;* second paragraph, *what it is used for.*

Have selected ones dittoed and pass around class for *discussion.*

Develop. idea of a *sentence*—subject, verb, and object.

Develop idea of a *paragraph*—unity and clearness.

Apply to a description of a *tool,* of a *process,* of a *machine.*

Ask class to write a letter ordering a *tool;* ordering some *supplies;* also a letter *applying for a job.*

Job Analysis Chart for Shop English

The chart shown herewith is a tentative *job analysis* for shop English.

It is to be understood that this is merely suggestive of a desirable approach.

Problems and Projects

CONCEALED ELECTRIC WIRING PANEL

WALTER B. WEBER

State Teachers College

Buffalo, N. Y.

The panel wiring of an electric bell system, for a two-family house, is very easily done by industrial-arts students. This is due to the fact that all the wires are exposed and the circuits can be traced easily.

In practice, however, the wires are concealed within the walls and require testing to make the proper connections. This type of work requires an added mental process, that of forming a mental picture of the complete system and keeping this picture in mind through the testing period.

The writer found that students who can readily install and connect a two-family electric bell system on the face of a panel have considerable difficulty in making the proper connections where the wires are concealed.

To help the student develop his thinking process a panel as shown in Figure 1 was developed. It consists of a 2½-in. vibrating electric bell and buzzer installed at the top, indicating the upper apartment, and a bell and buzzer in the middle of the panel representing the lower apartment. The two push buttons on the right side control the back-door buzzers. The push buttons on the left side control the front-door bells.

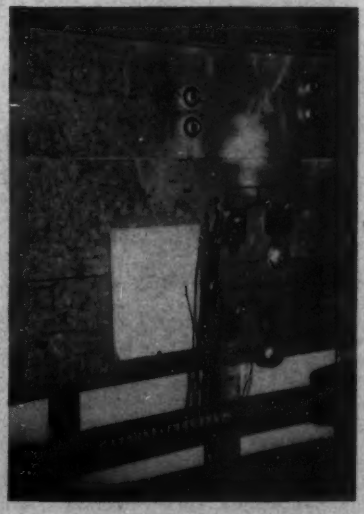


Fig. 1. The bell wiring bottom panel

The lower section contains the 12 wire terminals from the upper and middle sections, a 6 to 8-volt a.c. bell-ringing transformer with flexible leads for testing and for the final power supply of the system. Holes are drilled through the panel at the bell, buzzer, and terminal points. The wires are then connected and strung on the back of the panel to the terminals at the bottom. See the wiring diagram in Figure 2. These terminals represent the ends of the wires that would normally be found in the basement where the rough bell wiring was installed.

There are six terminals in the center which provide connections for the bells and buzzers and three terminals on each side providing connections for the buttons. Short pieces of No. 18 or 20 single-strand flexible cords with spring clips are provided for connections. They are snapped on the proper terminals to complete the connections. They take the place of the splices the electrician would make in a commercial installation. There is a grooved wooden strip at the top of the panel which provides space for hanging the flexible cords.

The instruction sheet attached to the panel shown in Figure 1, contains the wiring diagram and the following information. When an electrician wires a two-family house for an electric bell system, he does so when the house is partly finished, but before the lath and plaster are applied. He fastens three wires in the upstairs kitchen and three wires in the lower kitchen and runs them to the basement directly below this point. He then fastens

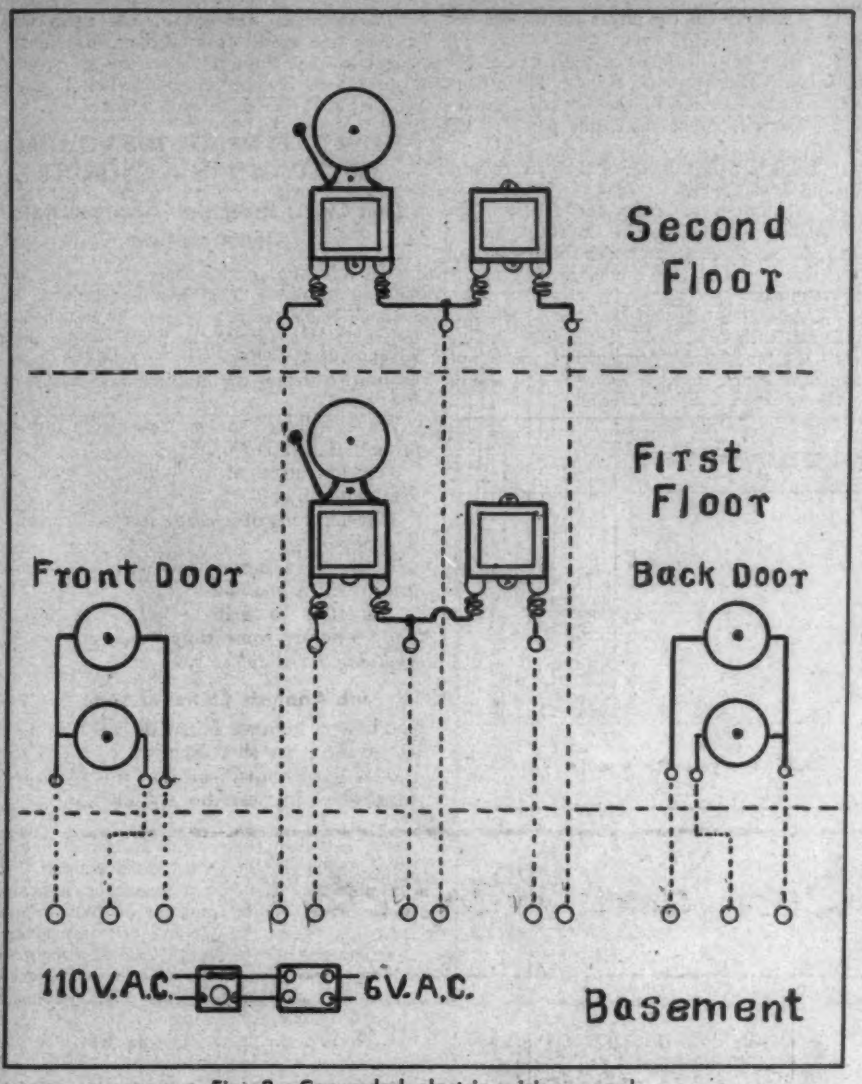


Fig. 2. Concealed electric wiring panel

three wires at a point where the front-door casing is to be placed and three wires where the rear-door casing is placed. These wires are also run to the basement. He does not complete the wiring and connections in the basement because they may be broken or stolen.

When the house is practically finished he or another electrician installs the bells, buzzers, push buttons, and transformer, and then extends the wires from the buttons and transformer to a point where the bell and buzzer wires end. He then tests and makes the proper connections.

The concealed wiring on the panel is a duplicate of what the finishing electrician finds when he enters the house. Your job is to test the wires at the terminals on the lower part of the panel and make the proper connections so that the system will operate correctly, i.e., the top and bottom push buttons on the left side, when pressed, must ring the top and bottom bells respectively. The buttons on the right side control the buzzers.

One thing to remember in testing is that you are supposed to be in the basement of a two-family house and have no way of placing one end of your test cord on the binding post terminals of the bells or buzzers. All the testing must be done at the 12 terminals at the bottom of the panel. Note that the wires on the 6-terminal and the 3-terminal sections on the lower part of the panel are not connected in the same order as shown in the wiring diagram. Their location must be found by testing.

The method used in testing will help to determine the amount of time required to successfully complete the job. You are being rated on the time required to correctly connect the system. This is a job where you are on your own. Use your initiative and finish the job in 15 minutes instead of a hit-and-miss method which may take a couple of hours of hard and discouraging work.

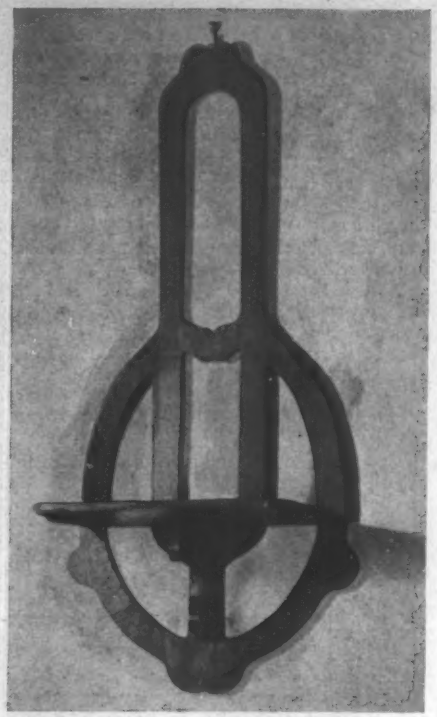
BANJO WALL SHELF

LYLE M. GARNETT

Milwaukee Vocational School
Milwaukee, Wis.

Purpose

1. To make a banjo wall shelf.
2. To use the jig saw.
3. To lay out irregular patterns from the drawing.



Banjo wall shelf

Technical Information

This wall shelf is a copy of an old shelf that at one time must have been used as a candle shelf because the original was covered with drippings of many candles. At present it is used for the display of many household knickknacks and treasured antiques. It is hung on the wall with the aid of a single hanger plate, which is a small piece of metal with a hole in one end for a small nail so it can be nailed to the shelf, while at the other end there is a larger hole to fit over the picture hook placed on the wall. The shelf may be made of walnut as was the original or it may be made of gumwood, pine, or any other stock that will finish nicely.

Stock Bill

No. of Pieces	Name of Part	Size
1	Back	5/16 x 8⅝ x 18 in.
1	Shelf	5/16 x 4½ x 8 in.
1	Bracket	5/16 x 2⅝ x 3¼ in.

Tools and Machines

Hand plane, 3/16-in. twist drill, rule, try square, hand drill, backsaw, hammer, pencil.

Construction Procedure:

1. Select the material from which to make the shelf.
2. Complete the stock bill.
3. Cut the pieces of stock asked for in the stock bill, but cut them ½ in. wider and ½ in. longer so as to allow material for finishing them to correct size later.
4. Plane one edge of the piece for the shelf straight and make this edge square with one of the wide faces.
5. Plane one edge of the bracket straight and square with the face of the bracket. Then square one end with this edge. All this work should be done with a hand plane.
6. Cut three pieces of paper the size of the pieces of wood needed for this shelf.
7. Fold the pieces for the back and the

shelf so you can draw one half the patterns on the pieces of paper. Draw light lines on the piece of paper for the back of the shelf and proceed to line it off in one inch squares. Draw in the pattern so the lines will intersect at the proper junctions of one-inch squares and carefully reproduce the pattern.

8. Repeat the same process for the shelf except that in this case it will not be necessary to lay out the one-inch squares for so simple a pattern.

9. Lay out the bracket pattern but in this instance the paper is not folded.

10. Cut the paper patterns with a scissors, then lay them on the pieces of stock and mark around them with a sharp pencil. Be sure to set the patterns for the shelf and the bracket on the stock correctly or the planed surfaces may be cut off and wasted.

11. Carefully cut the pieces for the bracket and shelf on the jig saw.

12. Drill 3/16-in. holes in the parts of the back board that are to be cut out. These holes are for the insertion of the jig saw blade.

13. Cut out all of the inside parts of the pattern.

14. Cut out the outside of the pattern with the jig saw.

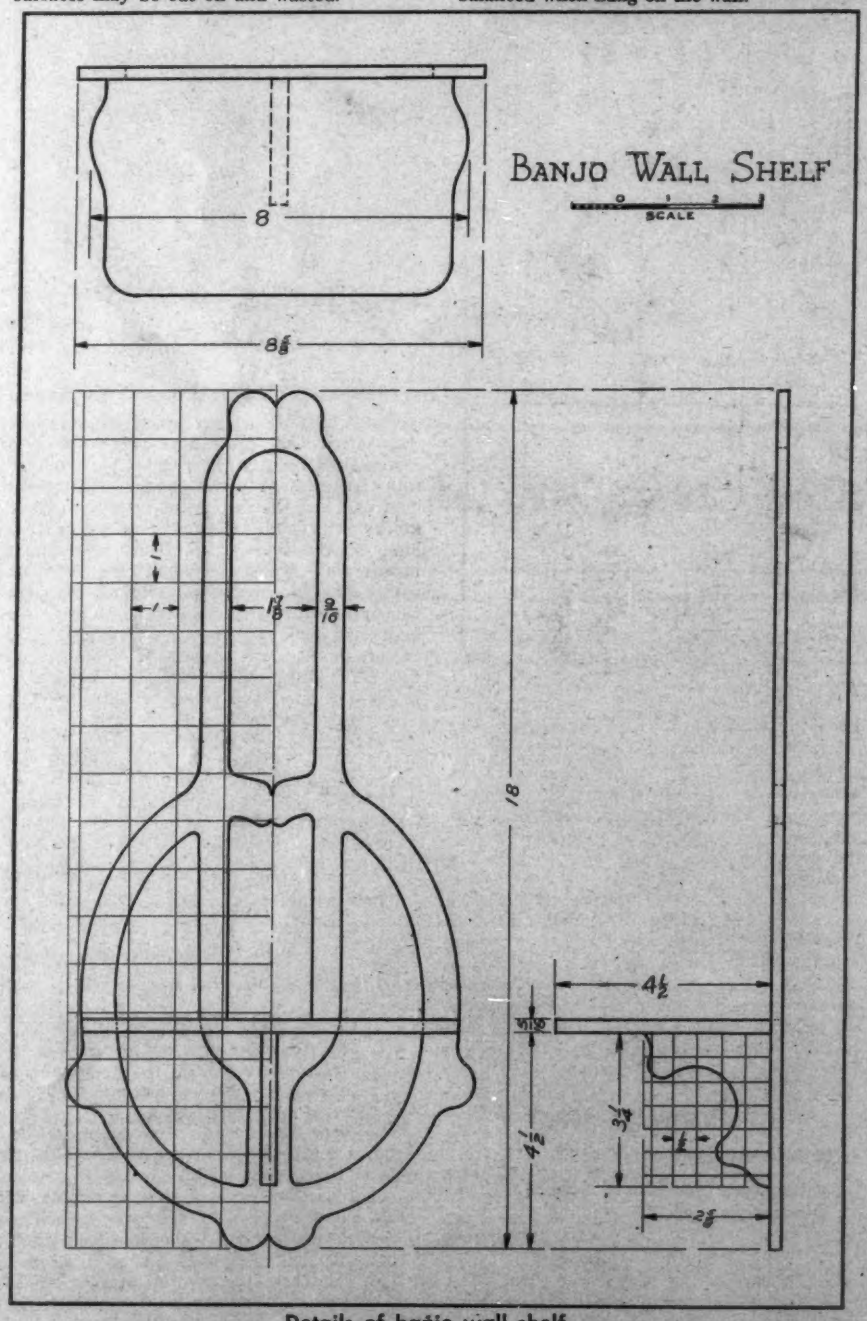
15. Sandpaper all edges and faces of the three pieces very smooth. Be sure you get into all the corners and make them square if they are to be square, round if they are to be rounded.

16. Assemble the shelf by nailing the pieces together with No. 18 by 1-in. wire brads.

17. Fasten one hanger plate at the top of the back board so the shelf will be properly balanced when hung on the wall.

18. Sandpaper the entire shelf again with a very fine grade of sandpaper. Round the edges a very little bit with this fine sandpaper so the finisher may do a better job.

19. Finish the shelf with a wax finish.

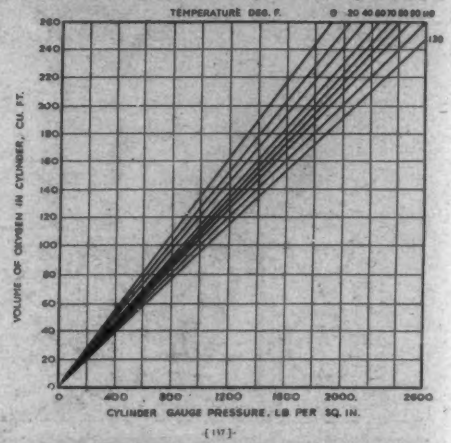


Details of banjo wall shelf

HOW TO ESTIMATE THE VOLUME OF OXYGEN IN A CYLINDER

This Chart Indicates Approximate Consumption

By referring to the chart, a welding and cutting operator can easily estimate the volume of oxygen in a cylinder to within 5 or 10 cubic feet. Locate the point on the chart where the vertical line (*cylinder gauge pressure*) crosses the diagonal line (*temperature*) and then follows the horizontal line to read the figure in the left-hand column. For example, if the oxygen regulator indicator indicates a cylinder pressure of 1400 lb. per sq. in., and the room or atmospheric temperature is 60 deg. F., the approximate volume of oxygen in the cylinder is 160 cubic feet. — From *Oxy-Acetylene Tips*, published by The Linde Air Products Co., New York 17, N. Y.



FUNDAMENTALS OF PRODUCTION ILLUSTRATION

W. S. MORGENTHALER

Abraham Lincoln High School
Des Moines, Iowa

Just as mechanical drawing may be referred to as the *language of industry*, so also in a modified way, may *production illustration* be dubbed as the *language of the assembly line*. This type of drawing, while not new by any means, is proving to be of great value in speeding up assembly work and in servicing all kinds of mechanical equipment. Drawings of this type as shown in airplane manuals and parts catalogs have proved to be of great value to service crews and mechanics. It has also been a great asset in training apprentice employees.

Figures 1, 2, and 3, are examples of the exploded type of drawings which illustrate the possibilities of rendering through the mediums — drawing ink and pencil. The "outer panel electrical system-installation" drawing, shown in Figure 1 (submitted through the courtesy of the Curtiss-Wright Corp.), is an excellent example of clarity of detail and of a bold but effective manner of arranging and shading parts so as to augment shape description. In an emergency, through consultation of the

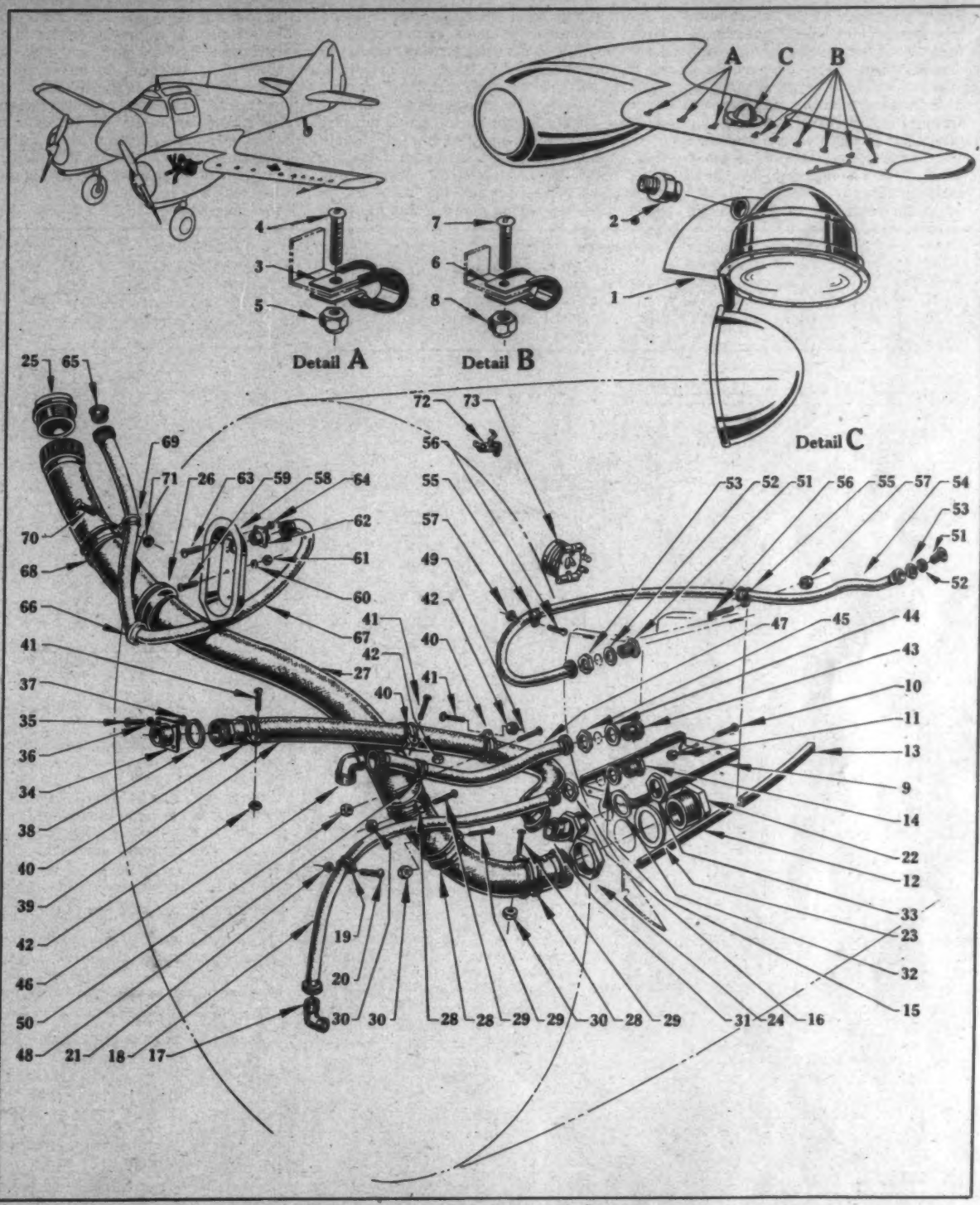


Fig. 1. An exploded type of drawing

parts catalog accompanying a plane, the identification of parts is aided very materially by these drawings.

Another type of drawing used a great deal of late for reproduction is drawn up altogether in pencil. Figure 2, the "connecting rod assembly," is reproduced from a pencil drawing. With some of the more improved pencils now on the market it is possible to draw clean-cut black lines which do not smudge easily and consequently compare quite favorably with ink. This does not prove, of course, that it can displace ink as a medium which because of its clean-cut lines and permanency will always be regarded as the last word in the rendering of a finished drawing.

The merits for producing this kind of drawing in pencil, however, are:

1. Alterations may be made more easily to keep abreast of the rapidly changing installations in aeronautical equipment.

2. Because of the high percentage of irregular curves encountered, these drawings can be made much more easily in pencil than in ink. At best, irregular curves when used with ink, require considerable skill, time, and care. With many made-to-order shapes cut from celluloid to use in making outlines this is very difficult and most adjustable curves are not very satisfactory for this type of work.

Most production-illustration drawings are drawn to scale and as much freehand work is eliminated as possible. Often it is advisable to fit a number of these together for a larger assembly or cutaway drawing. Many common practices are being formulated in

the use of type lines such as the object outline, reference lines, center lines, reader lines, and the manner of depicting detail parts which need enlargement.

Another field in which this type of drawing is used in increasing numbers, is that of auxiliary drawings for the clarification of the complicated aircraft blueprints. Certain types of drawings, particularly three-dimensional hydraulic lines or wiring diagrams, are clarified immensely by cutaway sections of an airplane in which the wiring to be emphasized is drawn in bold relief while the other adjacent parts are shown in reference or in more subdued lines. These auxiliary-type drawings are usually drawn on pencil tracing cloth with a medium soft pencil and then the shading feathered out with a smudge stick. Figure 3 shows a Curtiss-Wright parts catalog drawing of the "center panel pipe installation." While this particular drawing was made in ink, it, nevertheless, demonstrates the effectiveness of shading in setting out the parts to be emphasized and adding depth to the drawing.

If the drawing is one to be made up for a parts catalog it is drawn on tracing paper about twice its final size, where it may be shaded up if necessary to insure correct interpretation when it is transferred to illustration board which is usually necessary if large spaces are to be shaded. The drawing may be inked and shaded directly with ink, or it may be completed in pencil as depicted on the connecting-rod assembly in Figure 2. In either case the large surfaces may be shaded with a grease pencil.

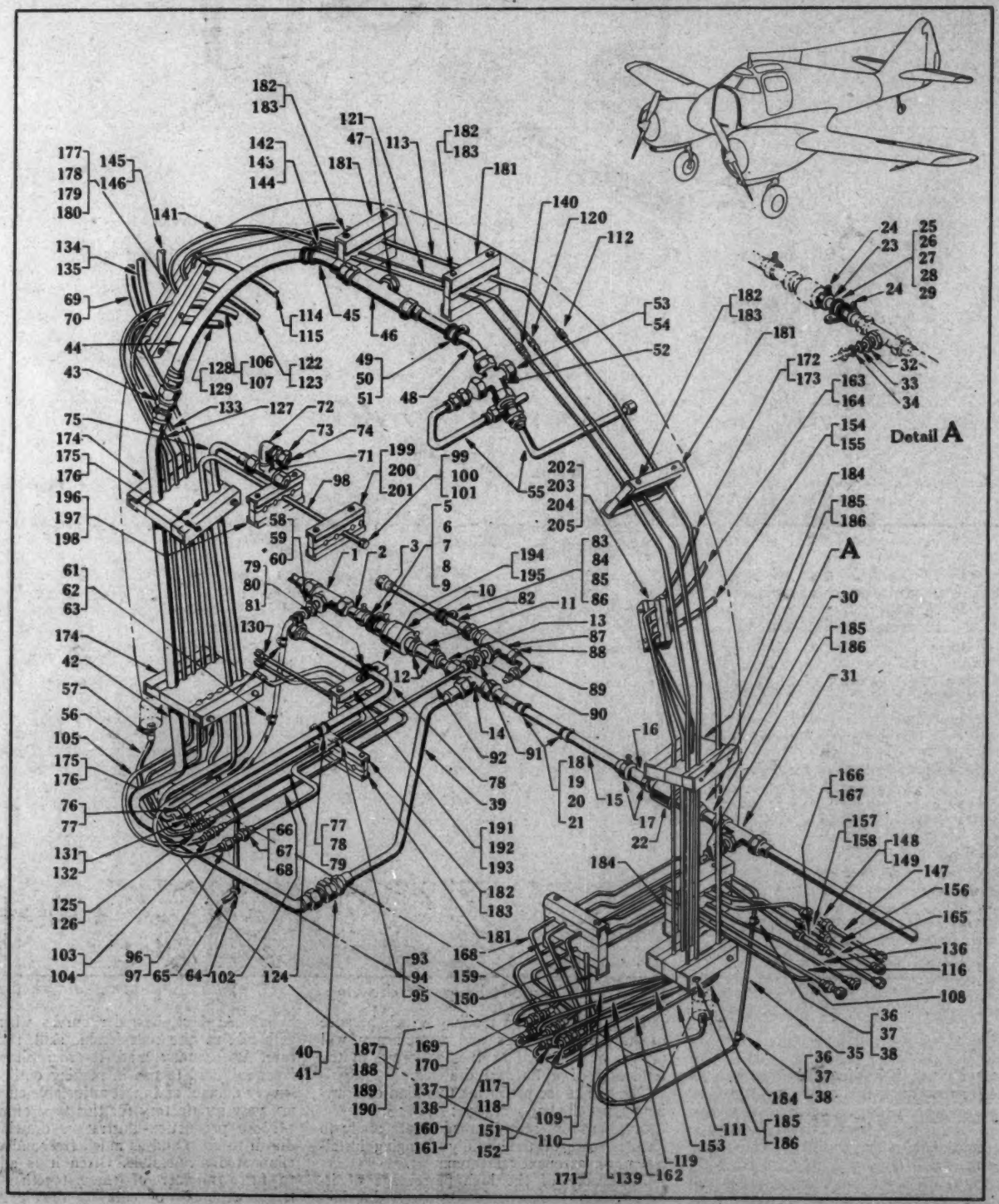


Fig. 3. Another example of an exploded drawing

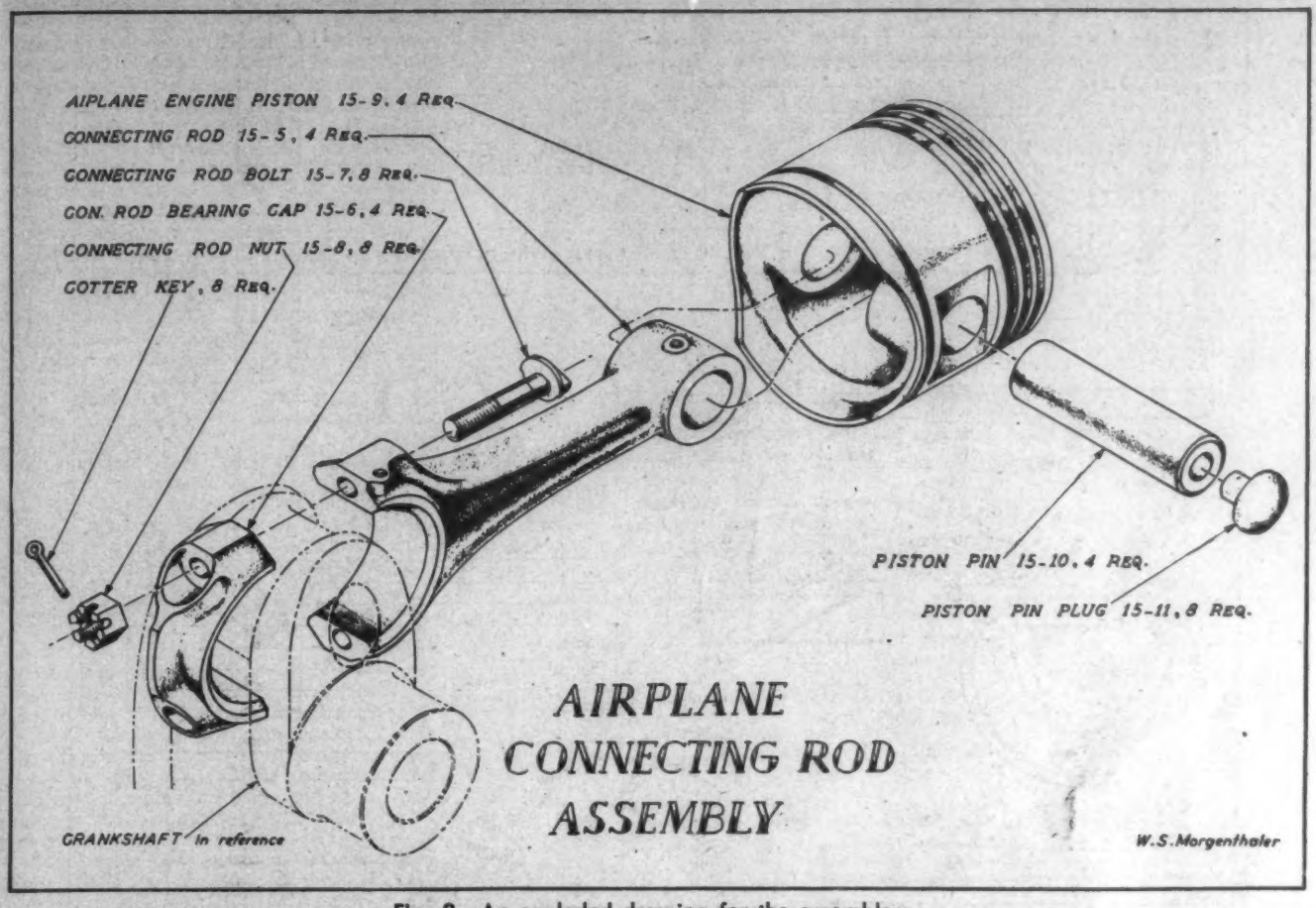

AIPLANE ENGINE PISTON 15-9, 4 REQ.
CONNECTING ROD 15-5, 4 REQ.
CONNECTING ROD BOLT 15-7, 8 REQ.
CON. ROD BEARING CAP 15-6, 4 REQ.
CONNECTING ROD NUT 15-8, 8 REQ.
COTTER KEY, 8 REQ.
PISTON PIN 15-10, 4 REQ.
PISTON PIN PLUG 15-11, 8 REQ.
CRANKSHAFT In reference
AIRPLANE CONNECTING ROD ASSEMBLY
W.S.Morgenthaler

Fig. 2. An exploded drawing for the assemblers

There is every likelihood that this type of drawing will be more generally used in all of the larger industries, as it is particularly valuable in clarifying drawings having irregularly shaped parts involving curved surfaces. While making drawings of this type is more difficult than orthographic drawings, they can be successfully done by a pupil who has a good grounding in making isometric drawing, and a semester or more of high-school level mechanical drawing coupled with a good knowledge of blueprint reading. Making these drawings can be simplified a great deal by the use of mechanical-drawing aids, such as templates for isometric circles, and the like.

Acknowledgment is made to Mr. H. W. Benjamin, Production Engineer; Mr. T. M. Toolen and Mr. C. E. Schmidt, Heads of Departments; and Mr. H. W. LeMert, Liaison Officer of the C-46 of the Curtiss-Wright Airplane Corp. of St. Louis, Mo.; for their assistance and co-operation in the selection of drawings and material contained in the article on production illustration. Thanks are expressed to this firm for their release of the drawings used in this article.

SIMPLIFIED MICROMETER — A HIGH-SCHOOL MACHINE-SHOP PROJECT

H. W. BABCOCK
Detroit, Mich.

A micrometer is a feasible high-school machine-shop project if it is of simple design. Its accuracy depends on the accuracy of the lathe used in cutting the threads and on the skill of the average student. But a satisfactory micrometer for general use is not beyond the high-school boy's talents. This one is simple enough so he can finish it in reasonable time without losing interest.

It is first necessary to obtain a frame pattern. A regular stock micrometer may be taken apart. The barrel is wound with tape to build up the diameter as an allowance for machining. This is then used for casting a permanent pattern. Care should be taken to obtain a good, smooth casting.

To machine the frame and barrel properly and easily, a fixture for holding is required. This is built up around a 2 by 2 by 2¼-in. steel body. See detail 1, Figure 1. That has been accurately squared. The two locators, shown in details 2 and 3, are fastened to the body with 3/16-in. dowels driven into No. 13 drilled holes. The drill guide, detail 4, is fastened to the body with one 10 — 24 f.h. machine screw and one 3/16-in dowel.

To locate the proper positions for the locators accurately, lay the micrometer frame in place on the fixture body and scribe the outline. The drill guide should be assembled last. With a micrometer frame in place, use a surface gauge to find the center for the hole in the guide. The guide is then removed, drilled with a No. 12 drill, hardened, and reassembled.

The fixture is then mounted on a lathe faceplate. Figure 2, shows the method of

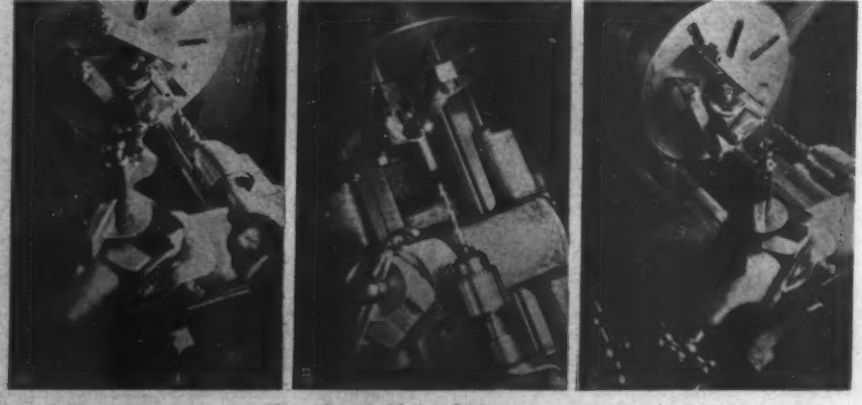
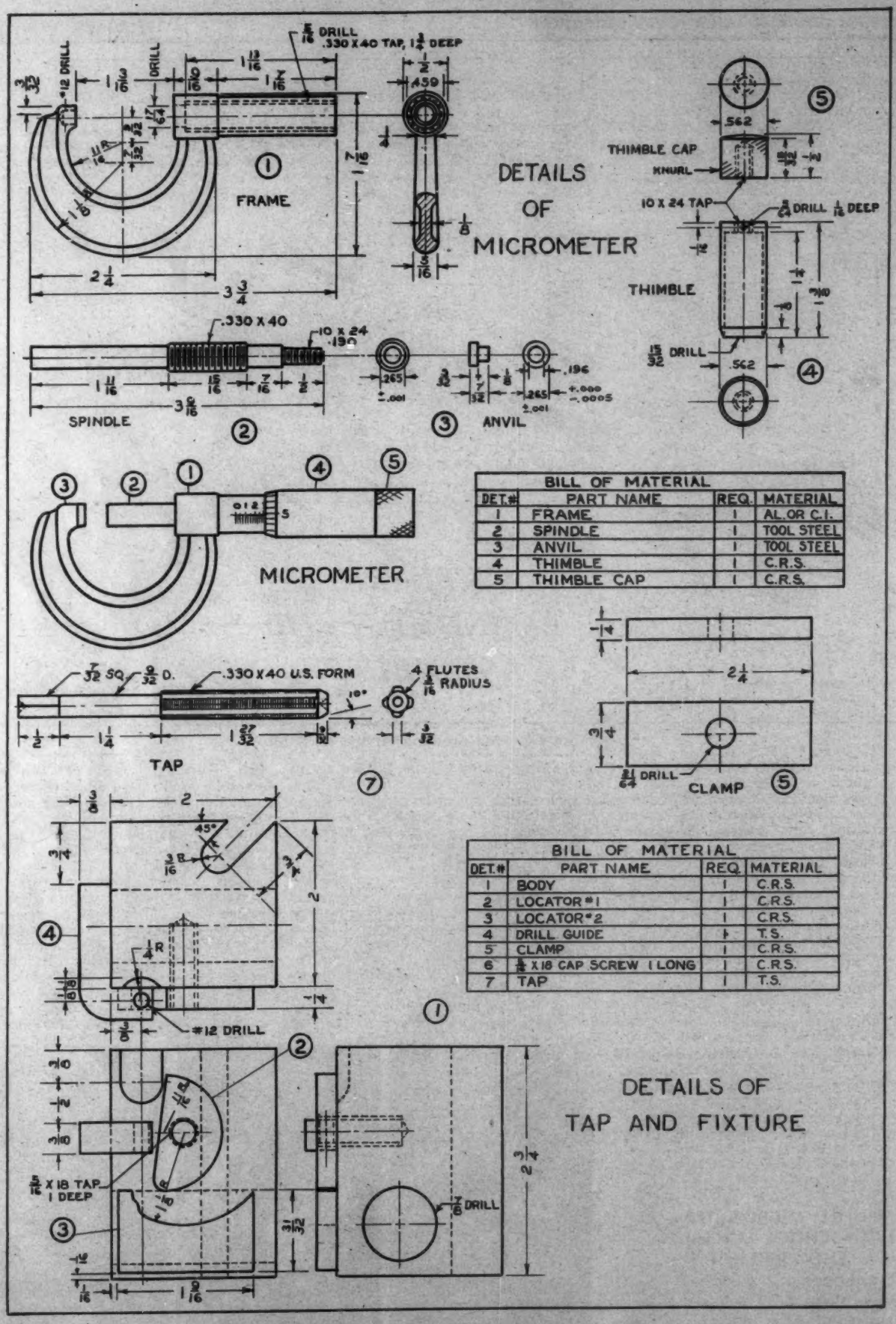


Fig. 2. Holding fixture in use



BILL OF MATERIAL			
DET.#	PART NAME	REQ.	MATERIAL
1	FRAME	1	AL. OR C.I.
2	SPINDLE	1	TOOL STEEL
3	ANVIL	1	TOOL STEEL
4	THIMBLE	1	C.R.S.
5	THIMBLE CAP	1	C.R.S.

BILL OF MATERIAL			
DET.#	PART NAME	REQ.	MATERIAL
1	BODY	1	C.R.S.
2	LOCATOR #1	1	C.R.S.
3	LOCATOR #2	1	C.R.S.
4	DRILL GUIDE	1	T.S.
5	CLAMP	1	C.R.S.
6	1/4 X 18 CAP SCREW 1 LONG	1	C.R.S.
7	TAP	1	T.S.

Fig. 1. Details of micrometer and holding fixture

clamping it in place. The micrometer frame can easily be machined by the student with a minimum of attention from the instructor.

The tap is turned out in blank, the flutes are cut at the mill, and then it is threaded. It is not cleared or backed off, and is found to be satisfactory in soft metal such as aluminum or cast iron. After being used once or twice the threads become smooth and polished.

The anvil and spindle are made from tool steel or its equivalent. Regular concrete reinforcing rods, ½ in. diameter, are satisfactory and very cheap. Their carbon content makes hardening possible. These parts are turned about .0005 in. oversize to allow for polishing with emery cloth after being hardened and drawn.

The thimble is held in the milling-machine dividing head for laying out the 25 divisions with a surface gauge. Then the markings are scratched deeper with a scriber. The figures are stamped on the thimble as it is held in a V-block with an arbor in the bore to make it solid enough to prevent bending.

The micrometer is then ready for assembly. The anvil is pressed into place. The thimble and cap are mounted on the spindle and locked together in the desired position by using a small spanner in the 5/64-in. hole, while holding the cap in a clamp or vise. In order to lay out the barrel divisions the longitudinal line is scribed first, then the thimble is screwed down to the zero position. Using the thimble end for a guide, the first line is made, the thimble is then turned one revolution and the second line made, and so on. The numbers are then stamped on the barrel and the micrometer is finished.

Adjustments for wear and accuracy are easily made by the use of the two-part thimble. It will be noticed that contrary to usual practice, no split bushing or other method of tightening the spindle threads has been provided. Such a detail may be added, but the principal advantage of the design is its simplicity for high-school use on an individual basis to be finished entirely by the student and not done as a production job.

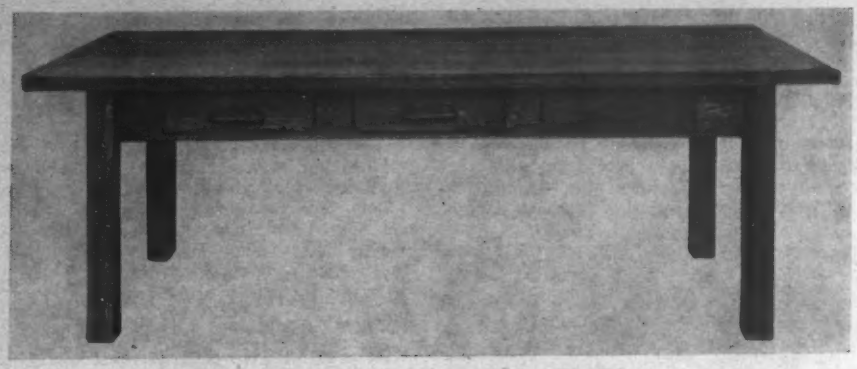


Photo by C. F. Zaenglein, Circleville, Ohio

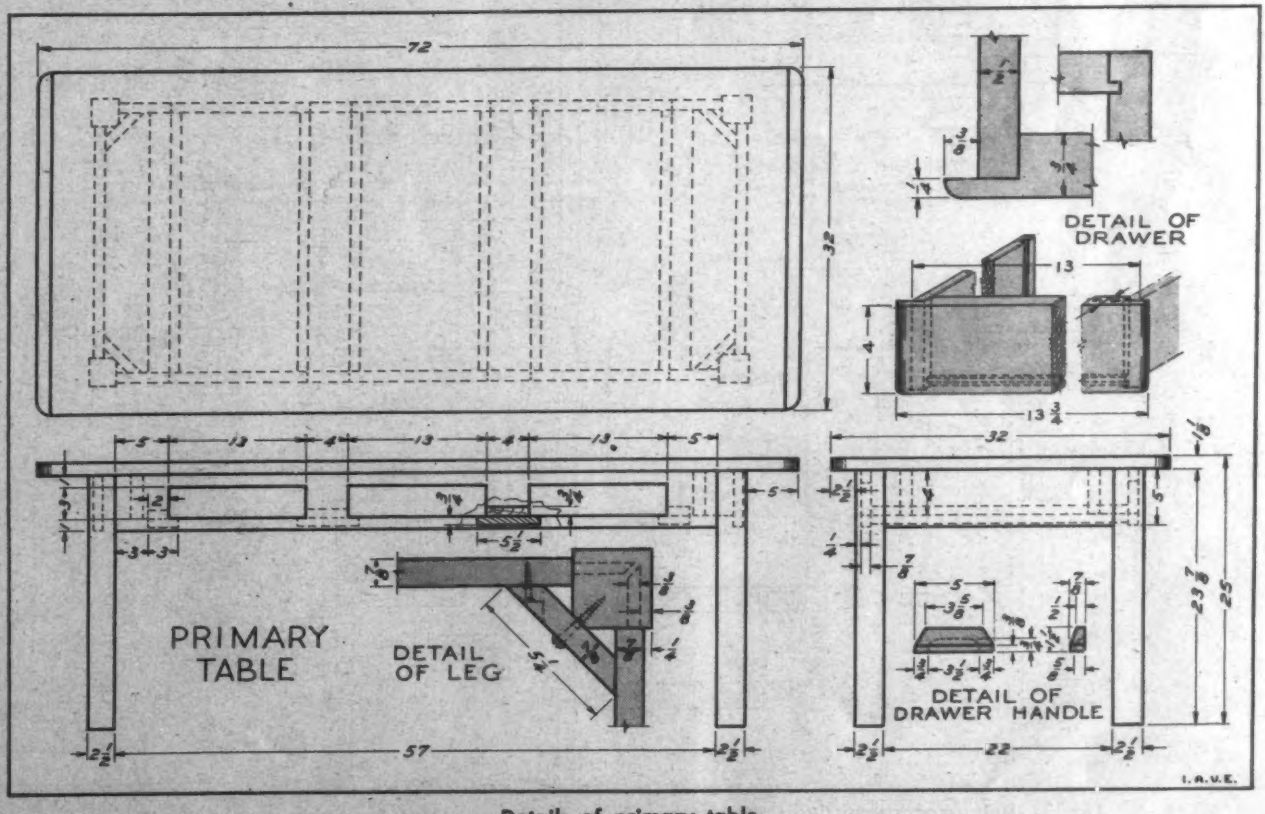
TABLE FOR PRIMARY CLASSES

C. F. ZAENGLEIN
High School
Circleville, Ohio

The modern trend of primary education is to equip the schools with more modern sur-

BILL OF MATERIAL

No. of pcs.	Name	Material	Size	
4	Legs	Oak	2½ x 2½ x 25	in.
2	Side rails	Oak	1 x 5 x 62	in.
2	End rails	Oak	1 x 5 x 27	in.
1	Top	Oak	1⅛ x 32 x 72	in.
6	Drawer fronts	Oak	1 x 4 x 13¾	in.
12	Drawer sides	Softwood	½ x 3 x 12	in.
6	Drawer ends	Softwood	½ x 3 x 12½	in.
6		3-ply Softwood	¼ x 12 x 13	in.
2	Drawer slides	Softwood	¾ x 5½ x 25	in.
2	Drawer slides	Softwood	¾ x 4 x 25	in.
2	Drawer slides	Softwood	¾ x 3 x 25	in
2	Drawer slides	Softwood	¾ x 2 x 25	in.



Details of primary table

roundings in their rooms, such as tables and chairs, instead of the formal system of desks.

It gives the child the same freedom that it has at home, and also has many other advantages which no doubt are already known.

Our school authorities have adopted this new method and our industrial-arts department equipped one schoolroom with the modern tables. The tables were designed in the drafting room and they were then constructed by the advanced class in our woodworking shop during the early part of the past school year.

The tables met the approval of the board of education, the superintendent, and the teacher.

The experience in making these tables provided our advanced students with an unusual amount of educational value.

They were constructed of rough oak lumber at a cost of from one fourth to one third of regular factory made tables.

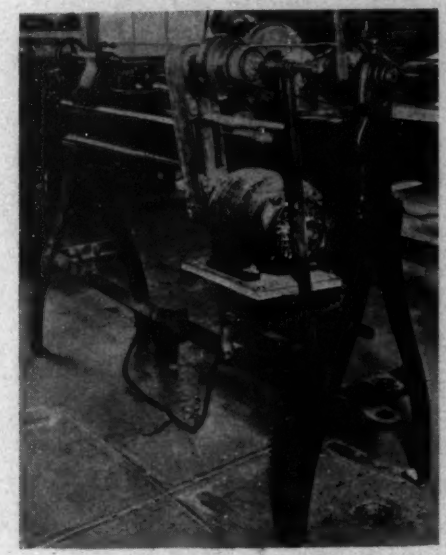


Fig. 1. Motor-drive unit with belt tensioning lever down

LATHE-DRIVE UNIT

HOMER C. ROSE

At present with U. S. Armed Forces

Individual motor drives for machines follow the trend of modern tool design. Many old but otherwise well-built machines can be improved by the installation of a drive unit. These machines then become more portable and may be arranged conveniently for better light and greater safety. Elimination of overhead shafts and belting improve both the general visibility and the appearance of the shop.

The drive shown here has little loss of power through friction, is silent and free from vibration, and facilitates the changing of the belt on the cone pulleys.

Procedure

1. Cut side pieces, Part 1, to length and flatten the ends.
2. Drill ends of side pieces.
3. Cut cross pieces, Part 2, to length and grind to fit side pieces.
4. Assemble and weld frame.
5. Cut bearing housings, Part 4, to length and bore to size in lathe.
6. Lay housings in a length of angle iron and stand frame on them. The angle iron will help to align the housings.
7. Weld frame to housings.
8. Turn bronze bearing metal down to size for force fit into housings.
9. Cut bearings, Part 12, to length and press into place in the housings.

Fig. 2. Motor-drive unit with tensioning lever released for changing belt cone pulleys

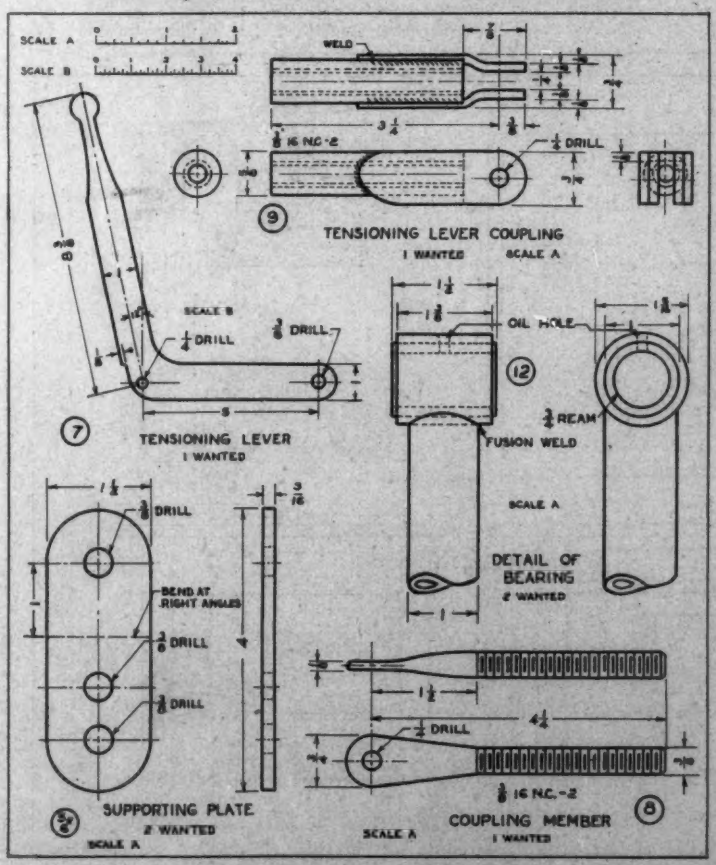


Fig. 3. Details of lathe-drive unit

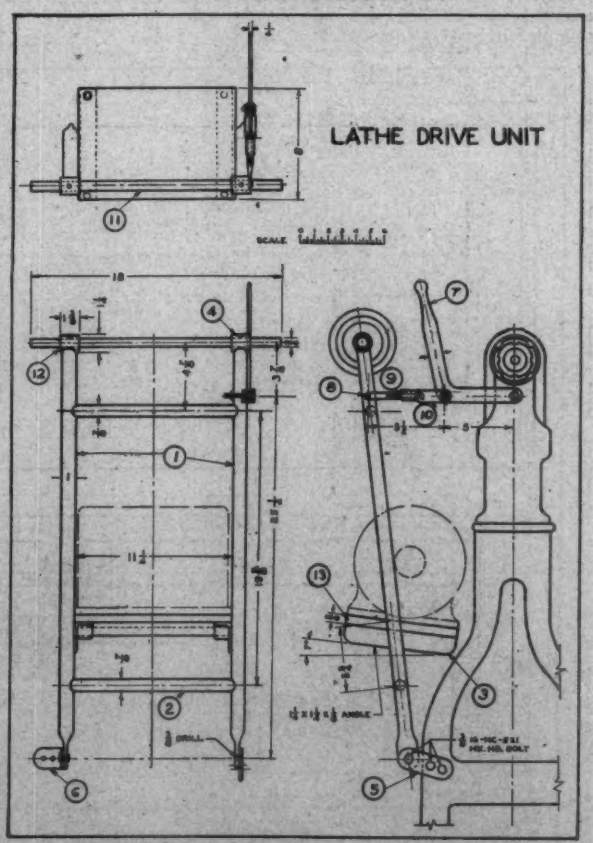


Fig. 4. Assembly of lathe drive

Bill of Material

Part No.	No. of pieces	Name of part	Material	Size
1	2	Side pieces	Iron pipe	1 in. O. D. x 30 in.
2	2	Cross rails	Iron pipe	¾ in. O. D. by 14½ in.
3	2	Motor supports	Angle iron	1¼ x 1¼ x 8 in.
4	2	Bearing housings	Iron pipe	1 in. I. D. x 1½ in.
5	1	Flat supporting plate	Band iron	3/16 x 1½ x 4 in.
6	1	Bent supporting plate	Band iron	3/16 x 1½ x 4 in.
7	1	Lever	Band iron	¼ x 1 x 14 in.
8	1	Coupling part	Iron rod	⅜ in. dia. x 4½ in.
9	1	Coupling pipe	Iron pipe	⅝ in. O. D. x 2¾ in.
10	2	Coupling plates	Band iron	⅛ x ¾ x 2 in.
11	1	Shaft	C. R. steel	¾ x 18 in.
12	2	Bronze bearings	Bronze	see drawing
13	1	Mounting board	Plywood	¾ x 8 x 14 in.
14	1	Mounting angle	Angle iron	1½ x 1½ x bed length of lathe

10. Locate center of bearings and drill to 23/32 in. between centers in the lathe.

11. Ream bearings between centers in the lathe. Drilling and reaming between centers is necessary to assure alignment of bearings.

12. Cut horizontal angle iron shown between legs of lathe in Figures 1 and 2, and fit to lathe.

13. Lay out and cut two supporting plates for Parts 5 and 6. One of these should be bent to 90 degrees and bolted to the horizontal angle iron.

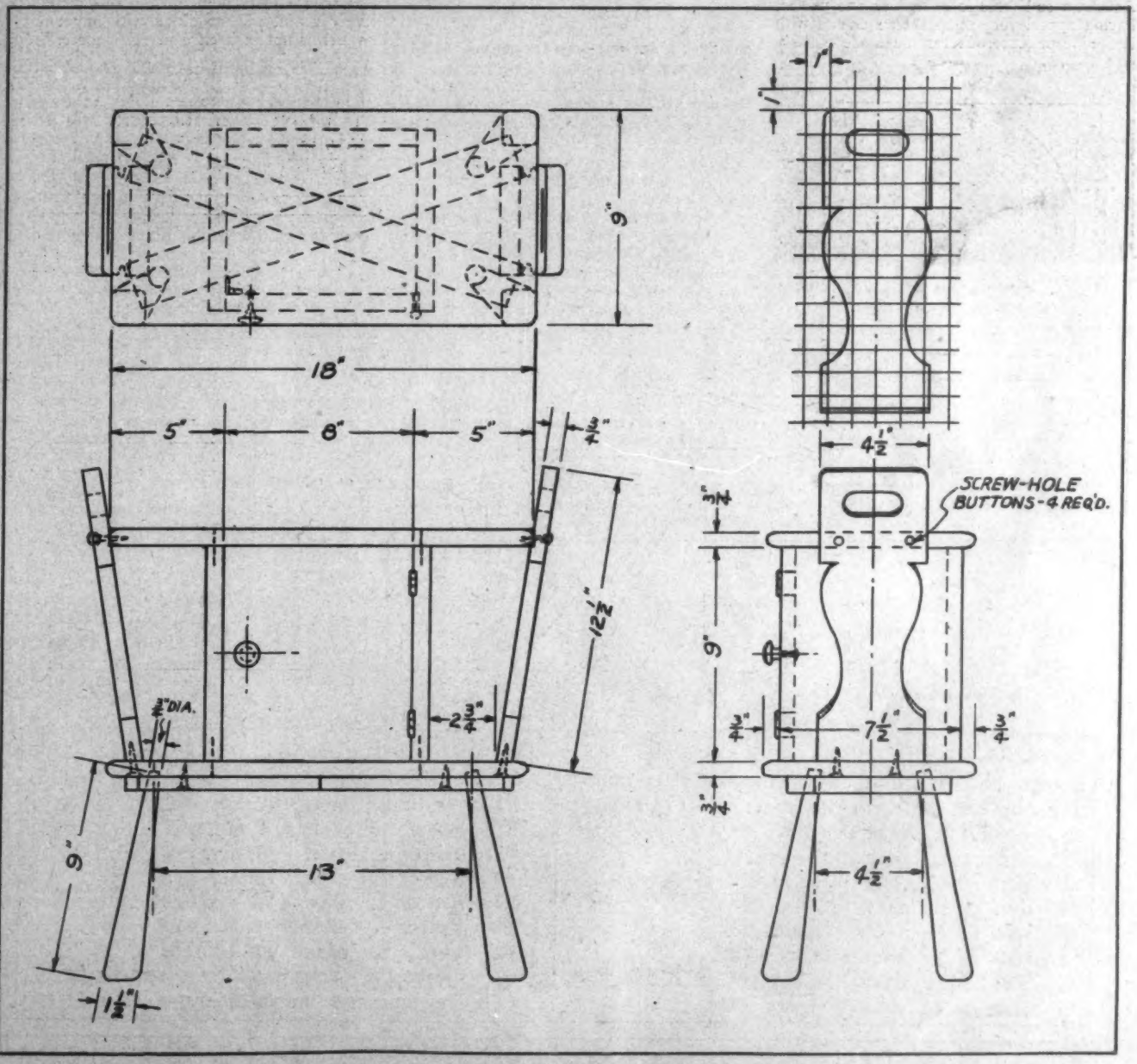
14. Bolt second supporting plate to leg of lathe. The two plates must be the same distance from the floor, and fastened in such a manner that the frame will be parallel to the bed of the lathe.

15. Cut angle iron motor supports, Part 3.

16. Weld angle irons in place so that distance from center of countershaft to center of motor shaft is correct for the V belt and pulleys selected. This may necessitate a rough paper sketch. In case of doubt it is better to allow too much space. The motor can be blocked up to the proper height during assembly.

17. Construct tensioning lever coupling, Part 8, as shown in drawing.

18. Cut and bend tensioning lever, Part 7.



Early American end table. (See description on page 80)

One end of iron can be clamped in vise. Then, while heat is applied at the proper point, the lever can be bent by hand.

19. Cut shaft, Part 11, to length and assemble all parts as shown in Figure 4. A flat fan belt or a leather belt may be used from countershaft to lathe. Care should be taken not to use a belt with a poor or bulging splice. The V belt should be properly guarded.

EARLY AMERICAN END TABLE

HOWARD HENRY
Central High School
Akron, Ohio

(See drawing on page 79)

The common problem of the shop teacher is to find projects which are simple enough in construction detail for students to complete successfully while at the same time appealing to them as "big and important" enough to satisfy their adolescent ambition. This Early American end table is offered as one project having appeal for young shop students with limited experience. It can be made entirely with hand tools, without appearing amateurish.

Of course, a lathe could be used to some advantage in turning out the legs from 1½-inch square stock. However, it is not burdensomely tedious to plane them by hand if each end is first scribed with dividers to the required diameter, some excess stock cut off the smaller diameter with a backsaw, and the stock then clamped between the vise dog and a bench stop for the final planing. Before boring the holes for the legs, they should be calipered to determine whether a No. 12 bit should be used, or a smaller one.

The turning saw is the most suitable hand tool for cutting the design on the right and left end pieces, followed by a half-round file for smoothing.

The rounded corners and arrises should be shaped with slight irregularities characteristic of Early American, intended to give the table a homespun appearance. It should be finished with a maple stain which is easily mixed from dry ground colors in the proportion of half raw sienna and half burnt sienna, thinned with linseed oil.

FINDING SQUARE ROOTS GRAPHICALLY

J. T. SAWHILL
Colorado Springs, Colo.

The sheet-metal worker should be able to lay out a square containing any given number of square inches, or the square root of a given number, without the delay of finding the length of the line in numbers. By the graphic method shown in Figure 1, the square root (in true lengths of line) for such areas as 8 sq. in., or 13 sq. in., are found with absolute accuracy.

To lay off a square containing 13 sq. in., a right triangle having for its base the square root of 8, and for its altitude the square root of 5, will have for its hypotenuse the sum of the square roots of the base and altitude; that is, the square root of 13. Note that the dimensions of the triangle are all expressed as square roots of numbers. This method is very useful when working with any number which is not in itself a perfect square. Study

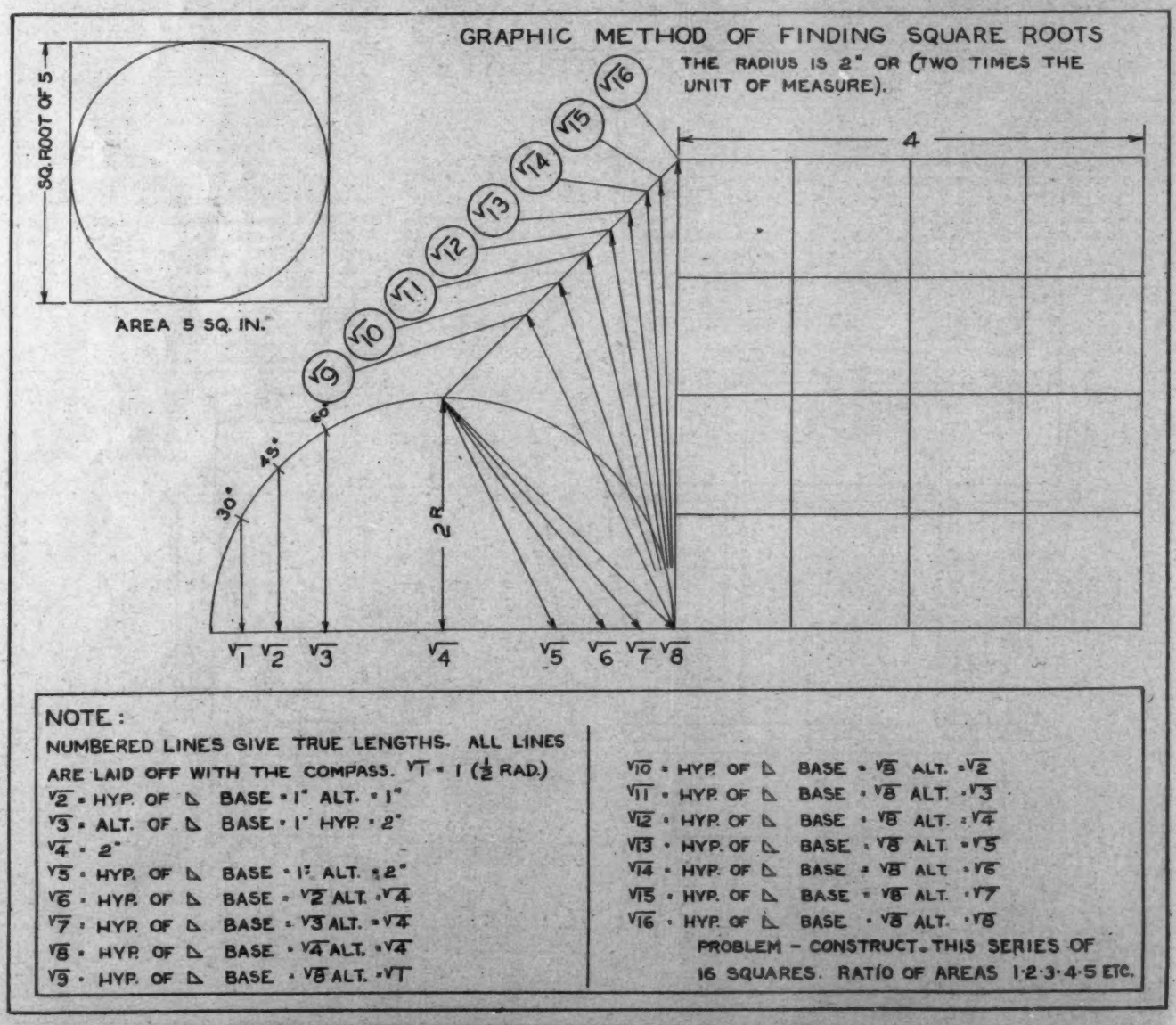

GRAPHIC METHOD OF FINDING SQUARE ROOTS
THE RADIUS IS 2" OR (TWO TIMES THE UNIT OF MEASURE).
SQ. ROOT OF 5
AREA 5 SQ. IN.
4
2R
30°
45°
60°
√1 √2 √3 √4 √5 √6 √7 √8
√9 √10 √11 √12 √13 √14 √15 √16
NOTE:
NUMBERED LINES GIVE TRUE LENGTHS. ALL LINES ARE LAID OFF WITH THE COMPASS. √1 = 1 (½ RAD.)
√2 = HYP. OF △ BASE = 1" ALT. = 1"
√3 = ALT. OF △ BASE = 1" HYP. = 2"
√4 = 2"
√5 = HYP. OF △ BASE = 1" ALT. = 2"
√6 = HYP. OF △ BASE = √2 ALT. = √4
√7 = HYP. OF △ BASE = √3 ALT. = √4
√8 = HYP. OF △ BASE = √4 ALT. = √4
√9 = HYP. OF △ BASE = √8 ALT. = √1
√10 = HYP. OF △ BASE = √8 ALT. = √2
√11 = HYP. OF △ BASE = √8 ALT. = √3
√12 = HYP. OF △ BASE = √8 ALT. = √4
√13 = HYP. OF △ BASE = √8 ALT. = √5
√14 = HYP. OF △ BASE = √8 ALT. = √6
√15 = HYP. OF △ BASE = √8 ALT. = √7
√16 = HYP. OF △ BASE = √8 ALT. = √8
PROBLEM – CONSTRUCT THIS SERIES OF 16 SQUARES. RATIO OF AREAS 1·2·3·4·5 ETC.

Fig. 1. Graphical method of finding the square root of numbers

Figure 1, then lay out the material shown, step by step, and learn that it is just as easy to draw triangles with square roots of numbers for dimensions, as with whole numbers for dimensions.

Since all of the lines used are "true lengths," forget for the moment their decimal values in inches, and consider their graphic lengths as developed by the triangles in the drawing.

Procedure: First draw a square, as shown in Figure 1, 4 by 4 in., and divide this square accurately into sixteen 1-in. squares. Our problem is to draw a series of 16 squares with areas running from 1 to 16 sq. in. Set the compass at 2 in., and draw the semicircles as shown. The radius of the semicircle is two times the unit of measure. Locate the point marked 30 deg., using the radius with which the circle was drawn, and striking the arc from the 90-deg. point at the top of the semi-circle. Now drop a perpendicular from the 30-deg. point on the arc to the base line. This perpendicular is exactly 1 in. in length and gives the square root of 1, or the side of the first square of the series.

The second square of the series must have an area of 2 sq. in. Locate the 45-deg. point on the arc, and drop the perpendicular as shown. This line gives the exact square root of 2; that is, a square having this length for all sides has an area of 2 sq. in. (Test the length of this line by placing it as the diagonal of a 1-in. square.) Next, from the 60-deg. point on the arc, drop a perpendicular to the base line, and we have exactly the square root of 3 (since it is the altitude of an equilateral triangle having 2-in. dimensions on each side). The square root of 4 is the radius of the semicircle, or 2 in. (a whole number).

For the square root of 5, note that we have a triangle, with square root of 4 for its altitude, and the square root of 1 for its base.

For the square root of 6, use the square root of 4 for its altitude, and the square root of 2 for its base.

For the square root of 7, use the square root of 4 for altitude, and the square root of 3 for base.

The square root of 8 is the diagonal of a square 2 by 2, that is, the hypotenuse of a right triangle having the square root of 4 for altitude and the square root of 4 for base.

For numbers from 8 to 16, use the square root of 8 for the base of the triangle.

Thus, for the square root of 9, use the square root of 8 for the base and the square root of 1 for the altitude. Test the length of this hypotenuse. It is exactly 3 in.

For the square root of 10, use the square root of 8 for the base, and the square root of 2 for the altitude.

For the square root of 11, use the square root of 8 for the base, and the square root of 3 for the altitude.

This may be continued, always using the square root of 8 for the base, until all of the square roots of the numbers between 8 and 16 have been found.

Having obtained the required series of true lengths, draw the full series of 16 squares. The areas of these squares run consecutive numbers of square inches from 1 to 16.

If a circle is inscribed in each of the squares, a series of circles with areas running from 1 to 16 in *circular inches* will be obtained. A *circular inch* is the area enclosed by a circle 1 in. in diameter. This drawing will form a useful chart in any shop. The true lengths of lines can be taken from the drawing by using the dividers, and dependable measurements may be obtained without using the value of 3.1416 as the value of pi.

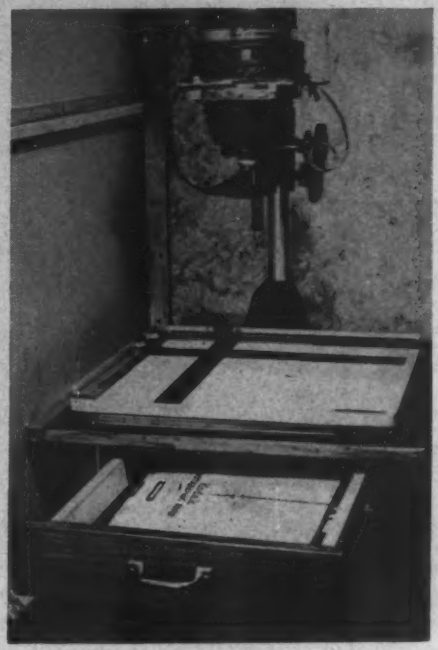


Fig. 2. The lightproof drawer in use

It may be well for the individual to draw a square of any size at random. This square is then to be divided into 16 small squares, after which a series of squares having areas from 1 to 16 times the area of the smallest, or unit square, may be worked out. This method is absolutely correct, and accurate drawing will give the *roots* for the entire series.

LIGHTPROOF DRAWER

C. F. ZAENGLEIN
High School
Circleville, Ohio

The lightproof drawer was designed in our industrial-arts department. The purpose of this drawer is to save time and material for those who work with sensitized paper, such as: photostat, blueprint, and photographic papers.

It is quite simple in construction and can be made by anyone who has access to the common power woodworking machines.

We have used these drawers for the past three years and they have proved to be very useful in our work, especially in the blueprinting and photography rooms.

The drawer can be used as a box and taken from place to place. It does not necessarily have to be used as a drawer. It can be placed on top of the working bench or worktable. The dimensions of the drawer may, of course, be altered to suit other conditions.

Order of Construction

Make all the grooves ¼ in. wide and ⅜ in. deep in the sides and back of part *C* and front *A*, at one setting of the saw, according to the dimensions shown in Figure 1. Saw out ends of sides *C*, as shown in drawing. Saw out 3-ply and assemble part *C*. Make all the grooves ¼ in. wide and ¼ in. deep about ⅜ in. from bottom edge of sides, front, and back of inside drawer *B*. Assemble inside drawer *B*. All work must be absolutely

BILL OF MATERIALS

No. of Pcs.	*Name*	*Size*
2	Sides of C	¾ x 3⅝ x 19
1	Rear of C	¾ x 3⅝ x 15½
1	Drawer front A	¾ x 3⅝ x 15½
2	Reinforcement strips	½ x 1 x 14
2	Top and bottom of part C	¼ x 14¾ x 19 — 3-ply
2	Sides of inside drawer B	½ x 2 x 17
2	Front and inside drawer B	½ x 2 x 14
1	Bottom of drawer B	¼ x 13½ x 16½ — 3-ply
1	Knob or handle for drawer front A	

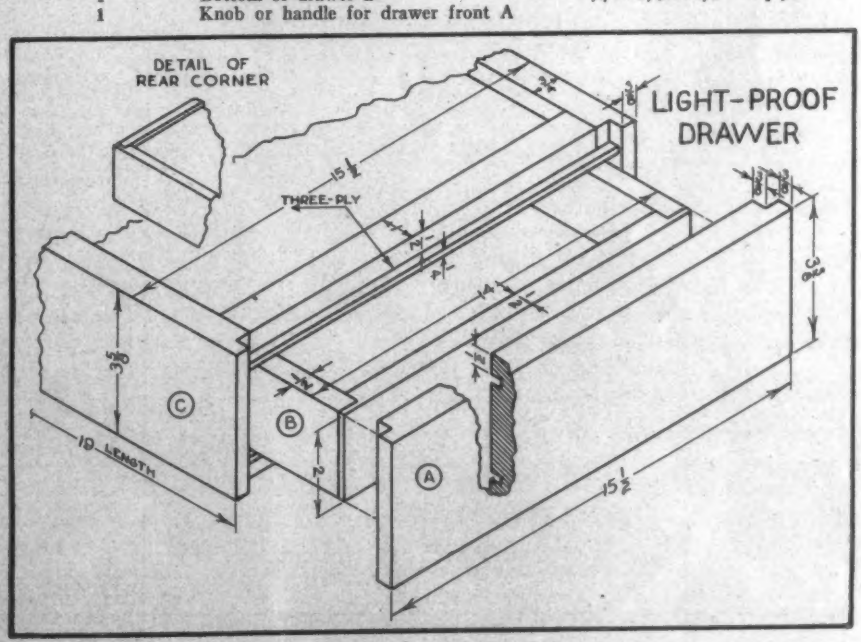


Fig. 1. Details of lightproof drawer

accurate and close fitting. The drawer front *A* is not fastened to part *B*, until the lightproof drawer is completed.

The proper method of fastening drawer front *A* to drawer front *B* is to place it inside drawer *B*, in its proper closed position. Then apply a thin coat of glue to the front part of drawer *B* and immediately place outside drawer front *A* in its proper closed position coming in contact with drawer front *B*. Allow to set for a few minutes. Then remove both *A* and *B* carefully in contact and clamp *A* and *B* together with C clamps or screws from inside of drawer front *B* to make it more firm.

The grooves in drawer front *A* may need a little sanding to allow the drawer front to slip into the 3-ply easily, but not too loosely. Glue should be used in all the joints. The finished project should then be stained and given two coats of varnish.

Figure 2 shows the lightproof drawer in position in the writer's darkroom. It is fastened to the table top with four screws which go through the top of the working table and into the top edges of part *C*.

TIE CLASP

RUFUS JACOBY
Coolidge High School
Washington, D. C.

Motivation in industrial-arts general metalcrafts can be stimulated by the inclusion of units in fabrication of sterling silver. The cotter pin tie clasp is an example of a beginning job, using half-round sterling wire. Although the design and fabrication appear simple, the completed job appeals to mechanically minded students. The cost of material is approximately 40 cents; the completed job is appraised at $4.

The informational content of the job consists of principles of design: composition, uses, melting point, and characteristics of sterling silver, production of wire, cost and how it is sold, oxidizing and polishing. The manipulative content consists of designing, sawing, layout, filing, executing the planned design, forming to shape, oxidizing and polishing.

The design consists of the shape of the clip, which is determined by its function, plus the use of units of filed lines (oxidized) to enrich the surface of face of the clip. The shape of the clip may be obtained from the accompanying job sheet, however; the filed design offers opportunity for individual design. Class instruction in basic principles of design applicable to this problem must precede planning by the student. The instructor should demonstrate the creation of several designs on the blackboard, applying these principles.

The filed grooves should be in units of three or five grooves. Three lines are more interesting than two because the eye can rest on the center groove. Odd numbers of units are preferable to even, for the same reason.

Careful planning is a prerequisite for a good product. Several designs should be sketched before deciding on the final design. The final design and plan of procedure must be approved by the instructor before work is started. After the blank is cut to length, the ends are rounded with a single cut smooth file. The ends and half-round surfaces are smoothed with No. 2/0 abrasive paper and Scotch stone. The design is filed with a *knife* or *slitting* shaped needle file, the blank being held in a *V* notch cut into a board. The depth of the filed grooves is 1/32 in.

When forming the clip to shape use a composition mallet and leather scraps to prevent marring the surface with tool marks. The final smoothing of the surface is accomplished with crocus or tripoli on a hard felt buff.

To make the filed design more outstanding, the entire job is immersed in an oxidizing solution. The solution is prepared by dissolving a piece of liver of sulphur the size of a small pea in a teacup of hot water. This solution will turn the silver black. To remove the oxidation from all the surfaces except the filed grooves, finish on hard 3-in. felt buff with crocus or rouge. Remove the abrasive compound from the clip by scrubbing with a tooth brush and hot soapy ammonia water.

RE-EMPLOYMENT OF RETURNED VETERANS

Returned veterans' statutory re-employment rights do not depend on whether or not they were hired during the war-production expansion period, according to an interpretation of National Headquarters of the Selective Service System, announced recently.

"The Law denies re-employment rights to veterans who left 'temporary' positions," the Selective Service statement said. "It is the opinion of Selective Service that all war jobs are not 'temporary' simply because such jobs were created as the result of war expansion."

The Selective Service interpretation was made in connection with various reports that employers had endeavored to fix a certain date on which their war activities began and thus claim that all employees hired after that date were 'temporary' employees and not eligible for statutory re-employment rights. Selective Service stated that no such date could be fixed as a criterion as to whether or not the employee was 'temporary' before entering military service and, therefore,

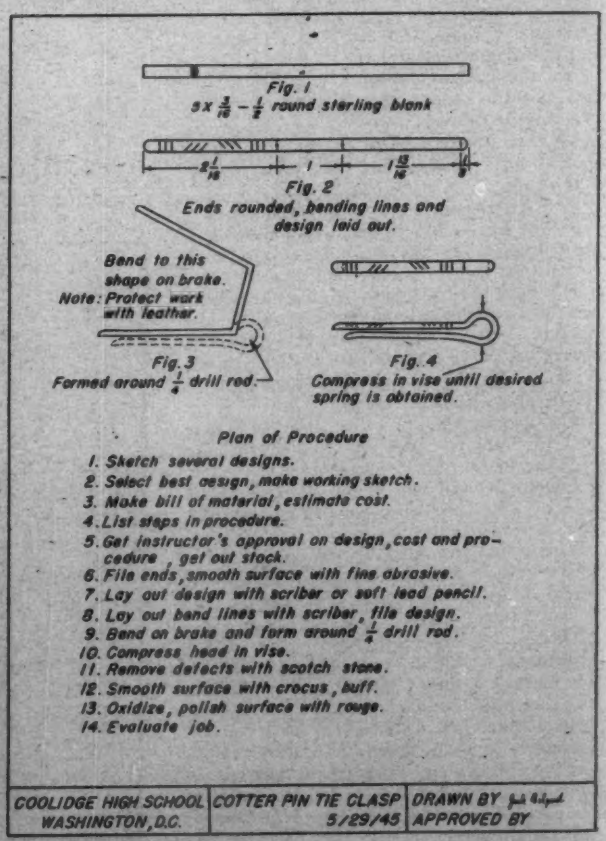


Fig. 1
5 x 3/16 - 1/2 round sterling blank
Fig. 2
Ends rounded, bending lines and design laid out.
Bend to this shape on brake.
Note: Protect work with leather.
Fig. 3
Formed around 1/4 drill rod.
Fig. 4
Compress in vise until desired spring is obtained.
Plan of Procedure
1. Sketch several designs.
2. Select best design, make working sketch.
3. Make bill of material, estimate cost.
4. List steps in procedure.
5. Get instructor's approval on design, cost and procedure, get out stock.
6. File ends, smooth surface with fine abrasive.
7. Lay out design with scriber or soft lead pencil.
8. Lay out bend lines with scriber, file design.
9. Bend on brake and form around 1/4 drill rod.
10. Compress head in vise.
11. Remove defects with scotch stone.
12. Smooth surface with crocus, buff.
13. Oxidize, polish surface with rouge.
14. Evaluate job.
COOLIDGE HIGH SCHOOL WASHINGTON, D.C.
COTTER PIN TIE CLASP 5/29/45
DRAWN BY
APPROVED BY

Tie clasp by Rufus Jacoby, Coolidge High School, Washington, D. C.

constitute a basis on which he might or might not claim statutory re-employment rights.

"Employers are protected under the Law from undue hardship by the provision that an employer is not obligated to re-employ a veteran if the employer's circumstances have so changed as to make it impossible or unreasonable to do so," the Selective Service statement pointed out. "Obviously, if the returned veteran's job no longer exists and no position of like seniority, status and pay exists within the company's activity, the employer cannot be required to create a job in order to fulfill the Law. Otherwise, however, the circumstances surrounding the veteran's original employment determine whether or not he was a 'temporary' employee but no fixed date can be considered the determining factor in such circumstances."

MOCK UP FOR OVEN CONTROL OF ELECTRIC RANGE

GEORGE H. WICHMANN

Greenway High School and Itasca Junior College

Coleraine, Minn.

The mock up illustrated and described in this article was designed and used as a teaching aid in senior high school electricity, electrical physics, and for special students interested in industrial applications and practices of electricity. Army and navy methods of instruction have emphasized the need for using demonstration and take down units for teaching and *putting over* concrete ideas and principles. The term *mock up* is the navy moniker for such a unit. The mock oven as described in this article demonstrates the

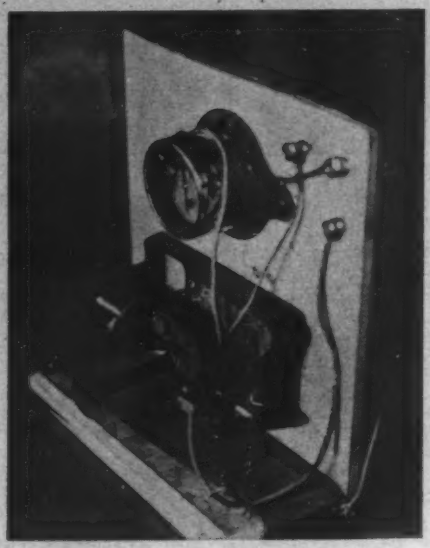


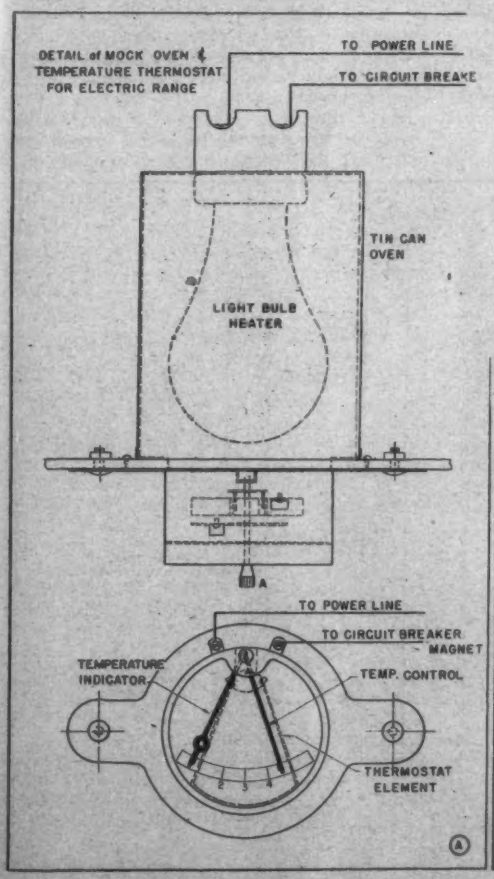
Fig. 1. Thermometer unit and circuit breaker

principles of operation of various units whereby the current heating the oven is automatically cut off when the temperature has risen to a predetermined degree.

Construction: Secure the thermometer unit and the circuit breaker unit from a discarded electric range such as the Westinghouse type. Mount these units on a vertical plywood panel as shown in Figure 1. Saw a round hole equal to the size of opening in the back of the thermometer unit. Secure a quart size tin can and cut a round hole in the closed end to fit screw type lamp receptacle. Solder lugs on the other end of can for mounting on panel. See Figure 2. The tin can will serve as the oven and the lamp bulb (60 watt) as the heating element. Complete the wiring as shown in the wiring diagrams in Figure 4.

Operation: Set the temperature control arm at 350 deg. F., close the circuit breaker points, and turn on oven power switch. The heat given off by the lamp bulb will rapidly heat the oven and the temperature arm will gradually move to the right. When at a temperature of 350 deg., contact will be made between the temperature arm and control arm. Since these two arms are wired in series with power and electric magnet, it will act as a simple switch and close the circuit. When the electric magnet is energized it will pull over the trip arm allowing the spring on the circuit breaker to open the main contact points of the circuit.

Learning applications: Since the mock up panel can be easily dismantled the student should study each part and unit as to construction, design, and operation. For example, inspection will show that the thermometer arm is actuated by thermostat arms pressing against pins on rocker arm on which the pointer is mounted. Hold a lighted match under each thermostat arm and note results. By using a test lamp show that the two temperature arms are insulated from each other. Next wire the terminals of the two temperature arms in series with power lines and test lamp. Turn the temperature control arm back until it touches and makes contact with temperature arm. From information gained by



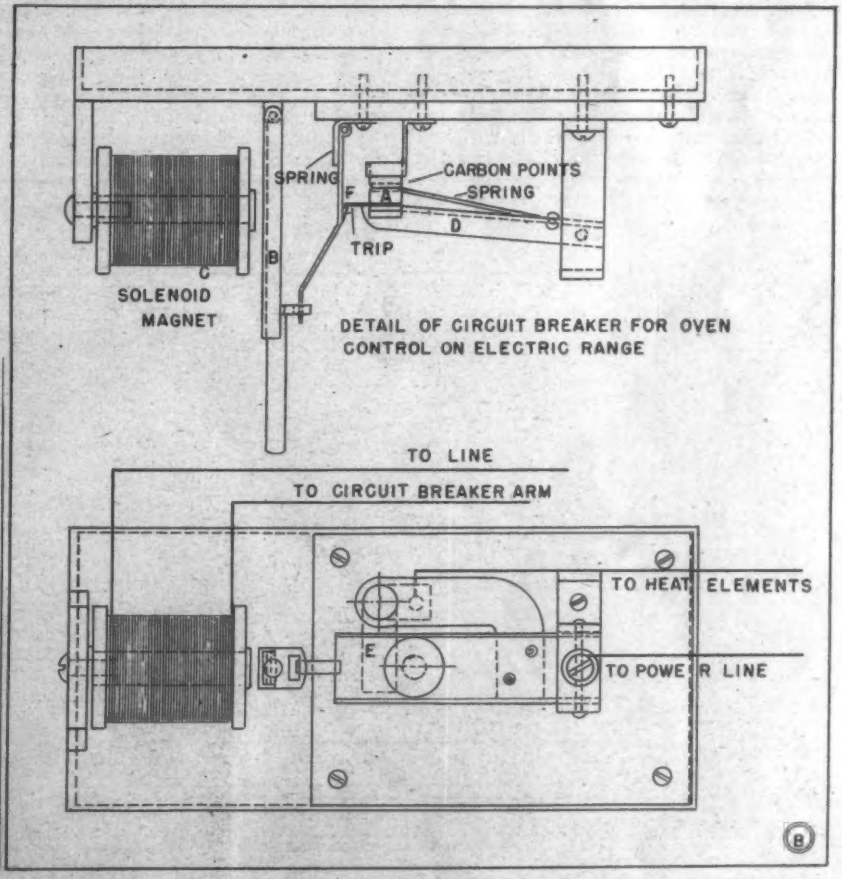


Fig. 2. Left — detail of mock up of oven and temperature thermostat. Fig. 3. Right — details of circuit breaker

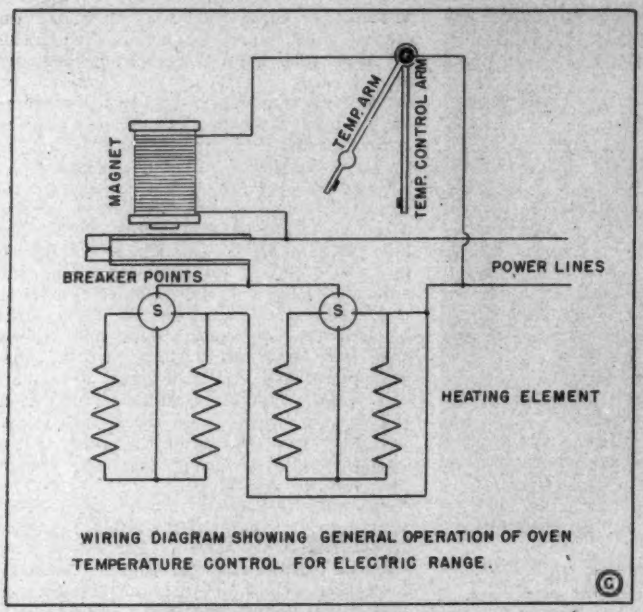


Fig. 4. Complete wiring diagram for mock up

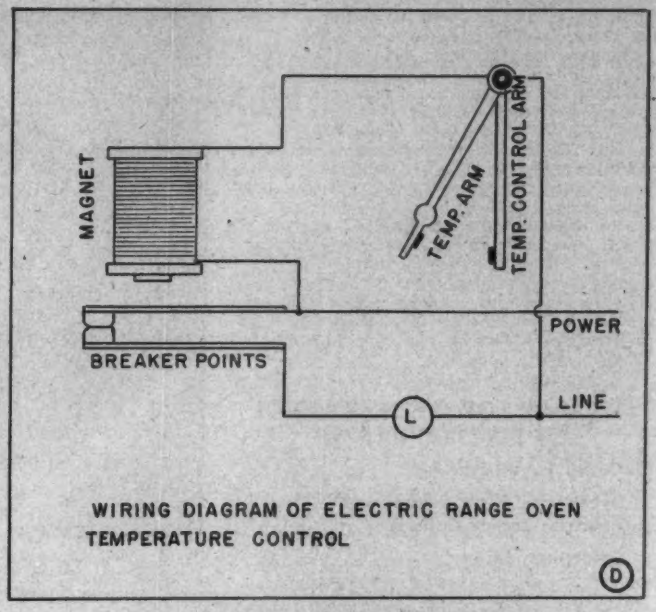


Fig. 5. Wiring diagram for oven

inspection and experimentation the operation of the thermometer unit should now be well understood.

The electric magnet opens up many interesting points for study, such as size of magnet wire, number of feet of wire on coil, resistance, impedance, current, reluctance of magnetic path self-inductance, and the special problem it creates.

The circuit breaker, upon casual inspection, would seem to be simply a switch, but upon closer examination, it will reveal some special features. Note that there are two sets of contact points, one set being made of copper and the other of carbon. Note that when the contact points are closed that the contact arm is under spring pressure. Also note that the carbon contact point is mounted on spring material. Trip the circuit breaker several times and observe that carbon contact opens last. Why this special design? The answer goes back to the high self-inductance of the magnet coil which tends to keep the original current flowing through the circuit and creating a hot spark wherever the circuit is broken. Here, then, lies the answer for using rapidly opening spring operated contact points, as well as the lagging resistant carbon contact points.

After study and experimentation with the various mock up units, the complete unit should be wired and operated. Figure 4 shows complete wiring for mock up. Figure 5 shows the wiring of the unit as applied to the electric range oven.

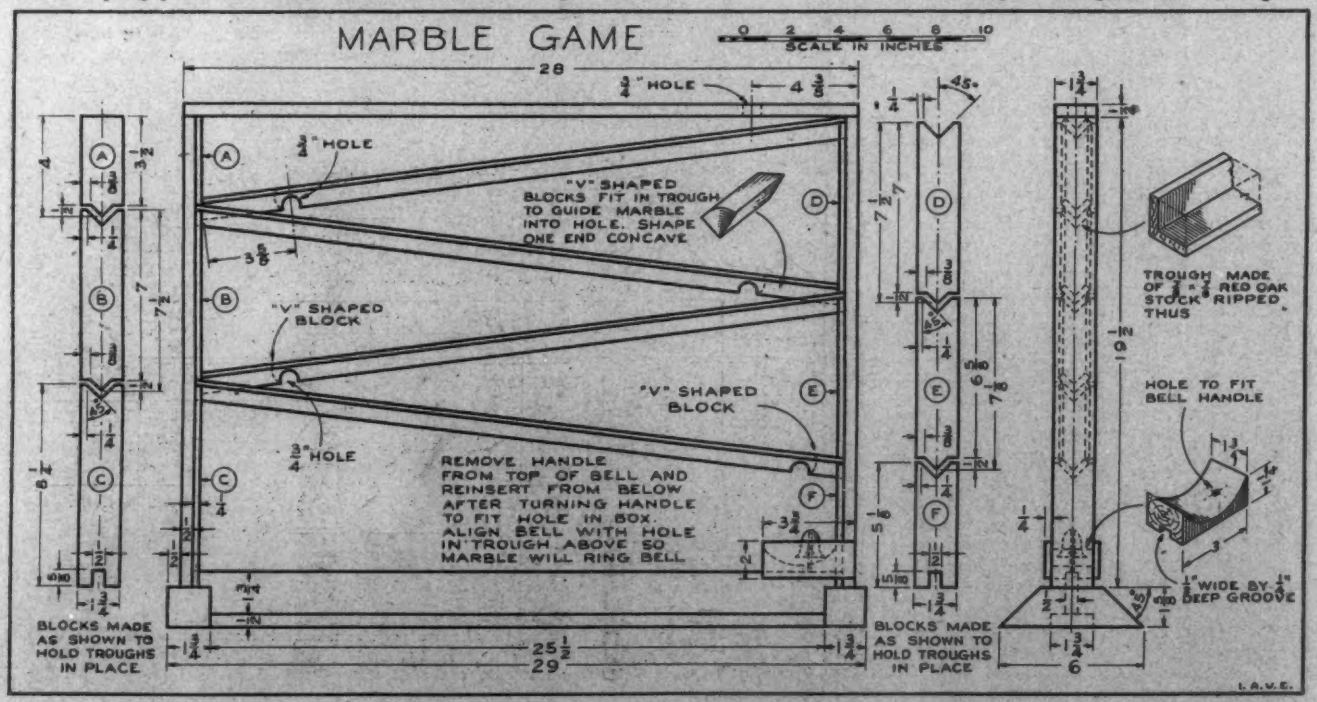
MARBLE GAME

R. E. MURRAY
Public Schools
Fremont, Ohio

The marble game, described in this article, creates much self-occupation and enjoyment for small children. It can be made without much expenditure of time and money.

The troughs are ripped from 7/8-in. stock, preferably hardwood, so as to insure rigidity and alignment.

Holes through the bottom of the troughs should be large enough to permit a good size marble to pass through without binding.


MARBLE GAME
SCALE IN INCHES
28
3/4" HOLE
4 3/8
"V" SHAPED BLOCKS FIT IN TROUGH TO GUIDE MARBLE INTO HOLE. SHAPE ONE END CONCAVE
"V" SHAPED BLOCK
"V" SHAPED BLOCK
REMOVE HANDLE FROM TOP OF BELL AND REINSERT FROM BELOW AFTER TURNING HANDLE TO FIT HOLE IN BOX. ALIGN BELL WITH HOLE IN TROUGH ABOVE SO MARBLE WILL RING BELL
TROUGH MADE OF 3" x 7/8" RED OAK STOCK RIPPED THUS
HOLE TO FIT BELL HANDLE
1/4" WIDE BY 1/4" DEEP GROOVE
BLOCKS MADE AS SHOWN TO HOLD TROUGHS IN PLACE
25 1/2
29
BLOCKS MADE AS SHOWN TO HOLD TROUGHS IN PLACE
6
I. A. V. E.

Details of marble game

All dimensions are clearly indicated in the illustration, and may be altered as desired.

The purpose of the game is to afford coordination by means of locomotion. Marbles are started on their journey through the hole in the top member. They then roll down the incline troughs, gaining momentum until they pass through the last hole, hit the small bell a glancing blow, and then come to rest in the receptacle at the bottom.

The unit should be painted in bright colors to further stimulate interest.

HISTORY AND ROMANCE OF ANIMAL GLUE

In the first glimmerings of civilization, primitive man found that there were other uses to animals he killed than just food. Skins were used for protection against the cold and they could also serve in the building of rough shelters. Plaques 4000 years old show the tanning of tiger skins. That was the beginning of man's know-how with leather. The experiences he secured in the tanning and preserving of hides and pelts led to other experiments. The result was animal glue, a powerful adhesive cooked from hide pieces soaked in water.

Among the stone carvings of ancient Thebes, and at least 3300 years old, is one depicting the gluing of a thin piece of rare wood of red color to a yellow plank of sycamore. A pot of adhesive is being heated over a fire and several samples of veneered and inlaid woods are pictured. One figure is shown spreading glue with a brush, and a piece of dry glue with its characteristic concave fracture is also depicted. That glues were early used for other purposes is demonstrated in writings of Pliny, the Roman, who referred to their use in paints by the Egyptians. King Tut, restorer of Thebes, was buried with all of his imperial furniture. Many of the individual pieces were made of wood joined with glue. When the tomb was opened some years ago, the glued joints were found to be as firm as when they were first set 30 centuries ago. Children's playthings have been held together with glue for thousands of years. In the stone foundations of ancient Persian temples can be found all types of glued toys and dolls.

Beginning with 200 B.C. occasional reference is made in literature either to glue or to the act of gluing. However, it was not until 1690 that the first commercial glue plant was founded in Holland.

First reference to glue in patent literature was in 1754. Early glue was made of hides soaked in water. First reference to bone glue occurred in patent literature in 1814. Glue-making was established in America in 1808. An early compendium of 1810 listed six establishments in Pennsylvania with a total product value for the year of $53,206, and one in Maryland with a product value of $500. In 1944 total production of animal glue in America approximated 150,000,000 lbs. with a sales value of thirty million dollars.

Up until the latter part of the nineteenth century, animal glue had been the only major adhesive available in commercial quantities. In the more than 3000 years that it answered almost all of civilization's need for adhesives, animal glue played a dramatic role in the perfection of many inventions. The Chinese craftsman Tsai Lun found animal glue the perfect sizing material when he invented writing paper in A.D. 105. The first cylinder printing press, forerunner of modern-day printing equipment, was judged a failure because a satisfactory inking device couldn't be found. The glue glycerine printing roller was the answer. The growth of the rayon industry has been marked by a proportionate growth in the consumption of animal glue by textile mills. Rayon yarn, unequipped with natural oils, needs to be sized with animal glue to prevent chafing or abrasion at the looms. Today more than 10,000,000 lbs. of animal glue are used annually by rayon mills.

Animal glue has played a vital role in both world wars. World War I saw the emergence of the United States as foremost producer of glue in the world. In World War II the use of adhesives in the manufacture of airplanes, cargo ships, torpedo boats, battleships, rifles, ammunition containers, engine parts for plane, auto, and tank, radio equipment, and many other military items has created new interest in this age-old product for peacetime use.—*National Association of Glue Manufacturers, Inc., New York City.*

During the war many people have learned, of necessity, the great importance that agriculture plays in their lives. They know the value of the land and have come to respect it. Surely they will not neglect this opportunity. Gradually the farms, the schools, and industry are becoming more closely linked. This goal must be achieved.

—Henry Ford.

WHITTLING-JACKKNIFE TECHNIQUE

W. BEN HUNT

Hales Corners, Wis.

(Continued from page 36 of the January, 1946, issue)

Buccaneer

This tough-looking buccaneer may look like a mean job of whittling, but it isn't by far as difficult as it looks. After the silhouette has been sawed out, it may be well to start at the hat, and work down to the belt line. Then lay out the soles of the boots on the bottom and work up to the waistline. Keep the whittling quite rough at the start, and don't cut away too much wood. Be careful to allow for the pistol and the belts. The belts are whittled after the general form has been finished.

There are two ways to go about whittling. One is to go in for detail and the other is to strive for effect. The latter method is probably the more satisfactory. Try to achieve action and balance, and do not be too much concerned about getting your article to look exactly like the one shown. After all, no two buccaneers looked exactly alike either. If you do not care for the type of boot shown, give your buccaneer loose pantaloons above the boot top, leaving the flare off the boots. Or you may want to change the hat to one of those wide-rimmed ones with a flat crown.

It is really a lot easier to whittle an original than to copy something. This may not seem true to most whittlers, but if you have been following this series of whittlings, you can undoubtedly make an original if you try. Just draw a rough sketch of the thing you wish to make. Perhaps only a side view is required. Then trace this sketch onto the wood and go ahead.

If the buccaneer is whittled out of cherry or mahogany, it need merely to be sanded and waxed. If it is whittled out of pine or basswood, it may be painted. The figure shown in Figure 199 is painted in the following manner. The hat is dark green with the upper edge a deep yellow. The face and hands are a reddish brown, with eyes, eyebrows, wisps of hair, and mustache in black. The cloak is a bright vermilion with collar, cuffs, and lower hem of a deep blue. The boots are black. The belt and sash are russet leather color, and the buckles an old gold color to represent brass. The pistol is gray and the dagger sheath is dark brown with brass trim.

For easier whittling the base was omitted. The figure of the buccaneer can be glued to any base desirable or the base may be made of a 1-in. board, cut straight at the back of the figure and rounded at the front end, and it will serve as one of a pair of book ends. In that case you will, of course, have to whittle two figures. It might be well to paint each of them in different colors for the sake of variety.

(See full-size pattern on next page)

Fig. 199. The buccaneer in roughly whittled, sanded, and finished state

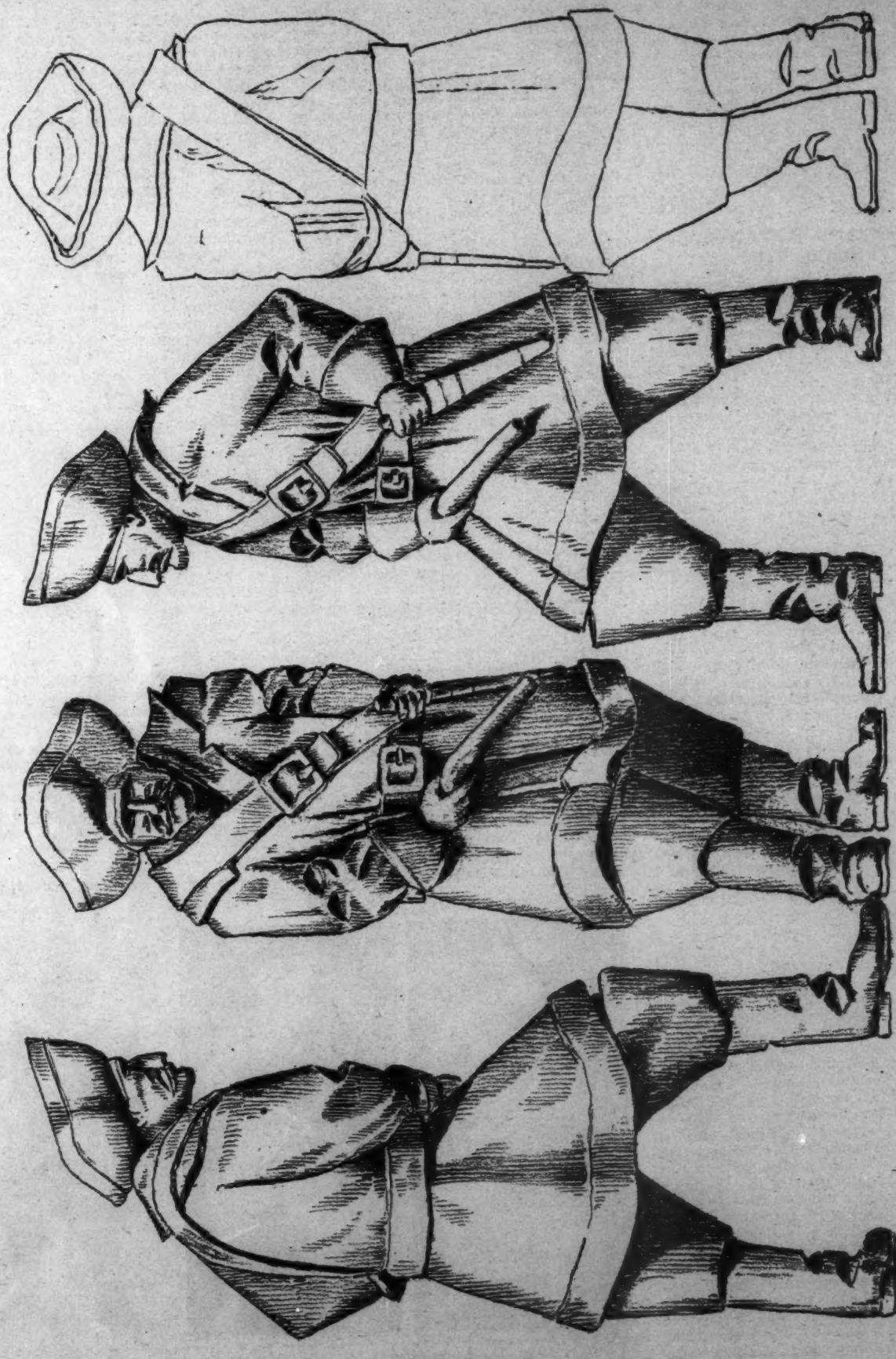


Fig. 200. Full-size pattern of the buccaneer

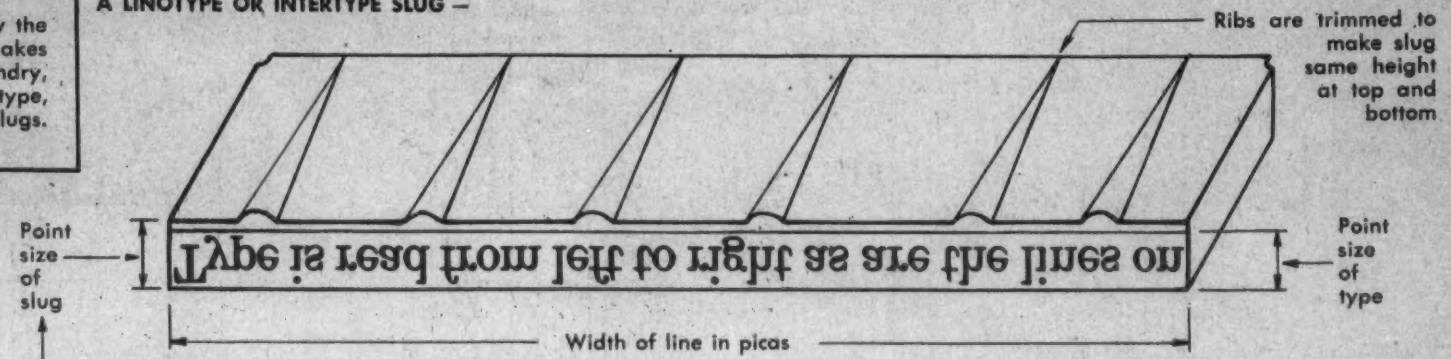
Differences in Type Production Methods

Lieut. Comdr. R. Randolph Karch, U.S.N.R.

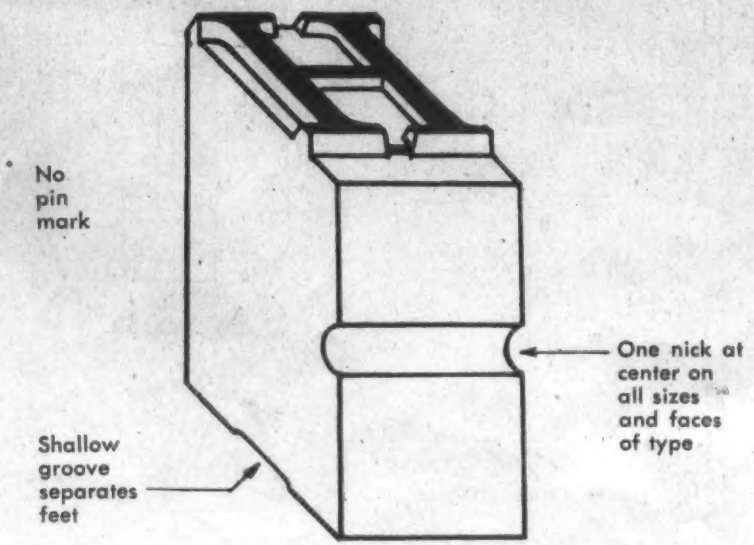
Training Literature Field Unit No. 1, New York City

Illustrations show the difference in makes of type — Foundry, Monotype, Linotype, and Intertype slugs.

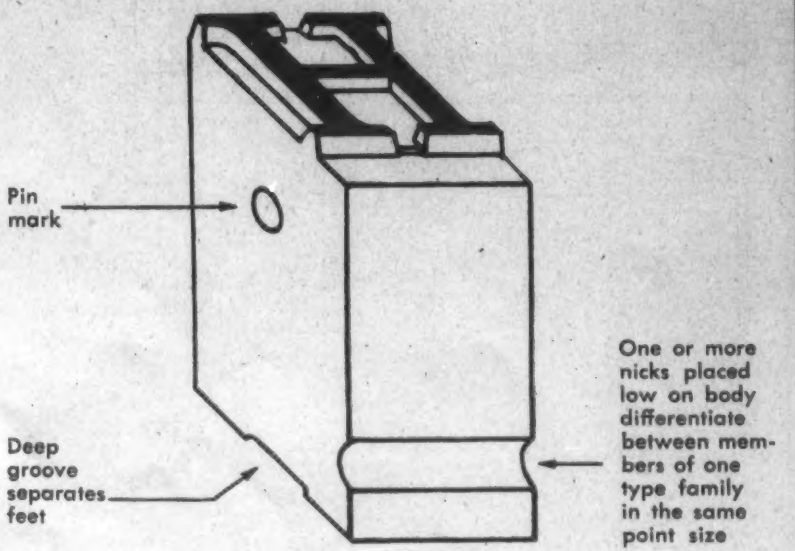
A LINOTYPE OR INTERTYPE SLUG —


Ribs are trimmed to make slug same height at top and bottom
Point size of slug
Point size of type
Width of line in picas
Leading is done by casting line on larger body than type face

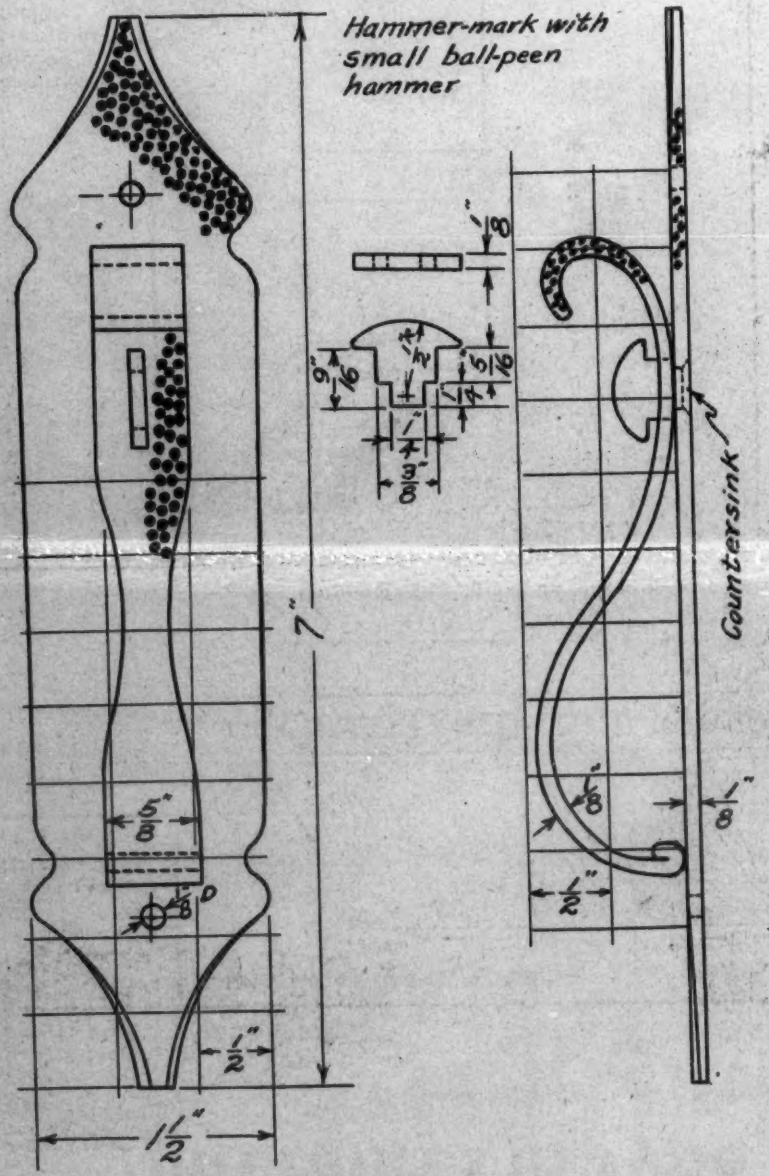
MONOTYPE



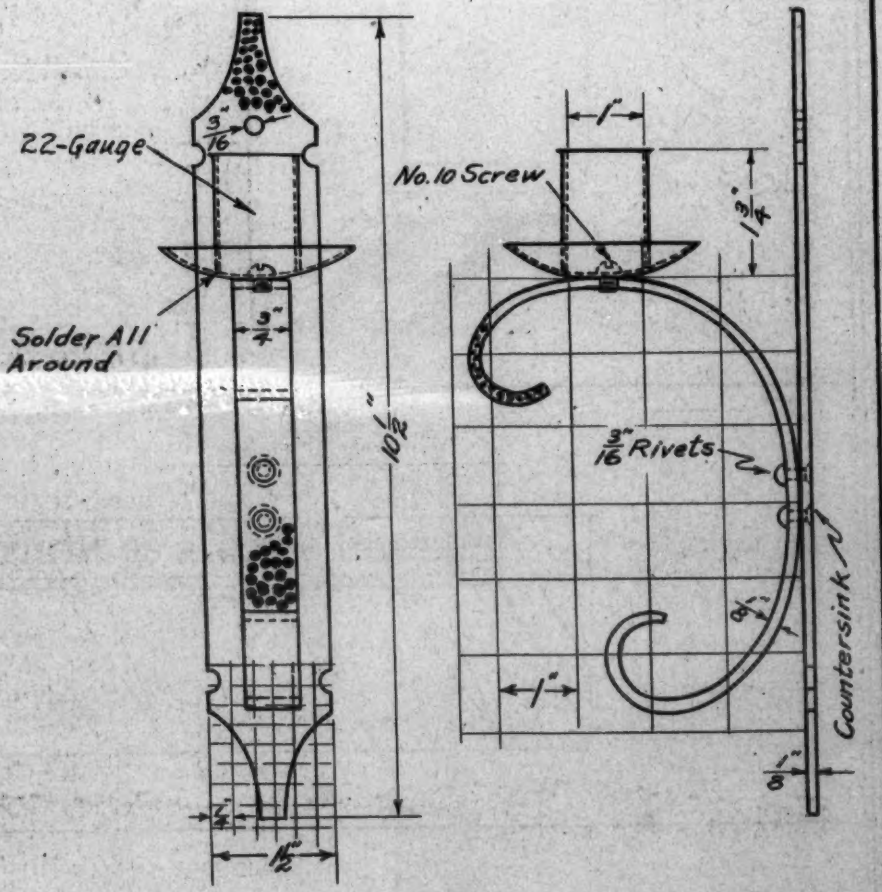
FOUNDRY TYPE


Pin mark
One or more nicks placed low on body differentiate between members of one type family in the same point size
Deep groove separates feet

DOOR KNOCKER



CANDLESTICK HOLDER



3-21-36

Designed by E. A. Rerucha, Community High School, Franklin Park, Ill.

Designed by E. A. Rerucha, Community High School, Franklin Park, Ill.

Greater Brilliance plus longer lamp life . . .

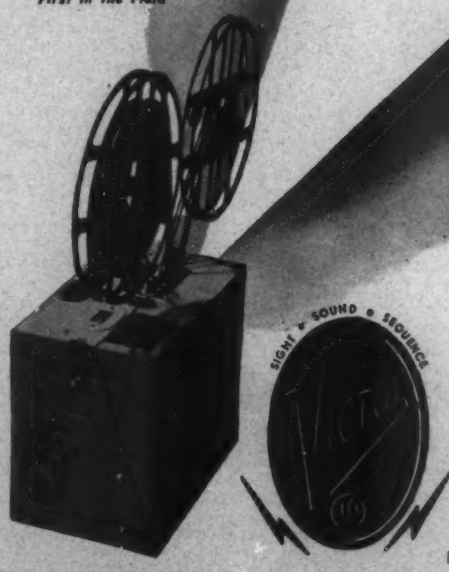
with Victor exclusive Spira-draft Lamp house

The Animatophone—16mm Sound Projector—First in the Field

During projection, lamps get hot . . . *very* hot. But only in the Animatophone this condition is anticipated and alleviated with Victor's exclusive *Spira-draft* lamp house. Only on the Animatophone is the cooled air forced in a spiralized, all-over, fast-moving stream through a multiple wall to dissipate heat more efficiently.

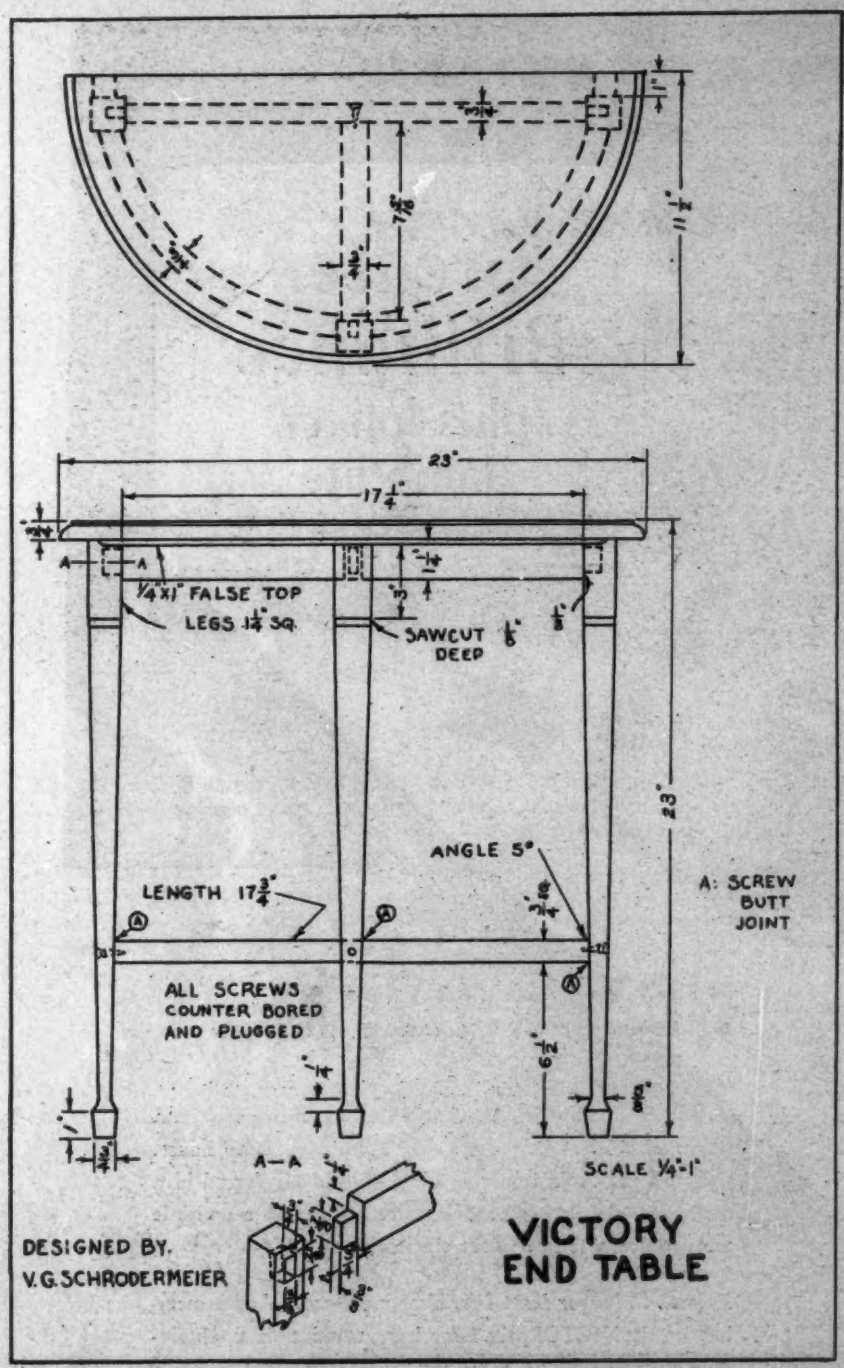
Result . . . longer lamp life, clearer pictures. And remember, on the VICTOR, the lamp has a standard base, obtainable anywhere, at no extra cost.

Here's another outstanding feature that gives the Victor Animatophone its leading position in the 16mm industry.



Victor Animatograph Corporation

Home Office and Factory: Davenport, Iowa
New York (18) McGraw-Hill Bldg., 330 W. 42nd St.—Chicago (1) 188 W. Randolph
MAKERS OF 16MM EQUIPMENT SINCE 1923



LATHE SAFETY SCREEN AND SOME SAFETY HINTS

G. HAROLD BILLINGHAM

Weehawken, N. J.

Woodturning-lathe safety is one of the constant focal points of instructors who have this equipment.

We have three lathes in our shop, lined up at a slight angle along a wall on one end of the room.

Student traffic is not heavy in this area except that of the variety saw, and the entrance to the finishing room is located near the lathes. A near-by coat-storage locker is not used after the period begins.

The first two lathes are devoted to straight turning, leaving the one in the corner for plankwise turning projects.

To further the safety angle, a portable screen, similar to those used in the familiar sand screening jobs was built and painted to match our modern color combinations. It is set up behind the operator who is making a bowl, or some other perhaps built-up turning project.

The screen is about 6 ft. tall and 3 ft. wide. The frame for the wire netting starts 2 ft. from the floor. The board for the support should be about 7 ft. long (a piece of pipe would be ideal), with a hinged joint at the top, and a hook, made of ⅜-in rod as a separator. It should, of course, be built to fit the area where it is to be used. Suspension from the ceiling could be considered, as floor space then would be clear of legs.

The screen is a safety reminder as well as a practical safety aid. It does not interfere with operator's movements. When not in use it can be collapsed and placed in a space against the wall. We have a pin to remove from the hinge to take care of the extra leg length. A telescoping leg will be our revision of the project.

The original rough turning, when the glue is removed together with surplus stock that would tend to make the work wobble excessively, is taken care of by having one student turn the machine over by hand, while the project builder uses a round-nose tool on the rest.

When permissible a lathe center is placed in the tailstock and removed into position against the work. A round-nose center is used when marks made by a standard tailstock center would show in the finished product.

Built-up stock must be thoroughly dry, and faceplates, screw chucks, etc., are not issued until gluing dates have been reached and checked. Students are urged to prepare material in advance so that stock will be ready during their particular lathe assignment period. Students who missed lathe demonstrations lose their turn until such time as they have made up the lesson.

Wood which students provide for lathe use must be watched carefully as in some instances it has not been seasoned. The original rough turning may not disclose flaws, but exposure to the air between periods will often develop unexpected cracks. Pieces of this sort are ideal for class demonstrations in wood processing.

The material removed during the turning process often causes discomfort to the operator's little finger, and our students wind a piece of paper, bandage, cloth, or adhesive tape around the finger at point of contact.

Personal News

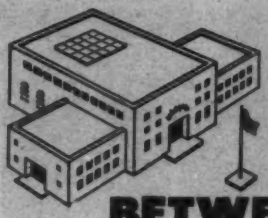
DR. MICHEELS TO MINNESOTA

Dr. William J. Micheels, who earlier spent five years at the University of Minnesota in a program of teaching and graduate work, will return

Dr. Wm. J. Micheels

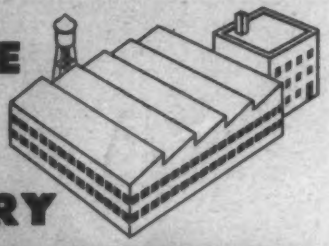
to that institution in January. He will fill the position vacated by Dr. Verne C. Fryklund, who was recently elected president of The Stout Institute.

(Continued on page 24A)



THE SHORTEST DISTANCE

BETWEEN SCHOOL AND FACTORY



IS A

Walker-Turner

TRAINING LINE!

Students trained on Walker-Turner Machine Tools find the transition from school to factory easy. Their daily school work has familiarized them with the very machines they'll find by the thousands in Industry. That's one of the big advantages of using these *production* machines.

By providing *faster* training, Walker-Turner Machine Tools "shorten the distance" in time, too! Simple to operate, they save tedious hours in the "breaking-in" period. Exceptional versatility, rugged construction, safe operation, low price are other important Walker-Turner features. Write today for our latest catalog.

WALKER-TURNER COMPANY • PLAINFIELD, N. J.

walker-Turner COMPANY, INC., PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

"Standard" ELECTRIC SHOP EQUIPMENT

For vocational and technical schools, Standard manufactures and furnishes such items as:

Control and Distribution Switchboards
Electric Panels for the benches
Motor Generator sets of various types
Machine Terminal Panels
Loading Units
Transformer Demonstration bench units

We have something to offer for the small shop in the manual arts courses, as well as more extended equipment for the larger schools.

Use our free, comprehensive service which will gladly make recommendations and plans, and submit layouts and costs covering the materials to meet your needs and budget.

Ask us to have a nearby field engineer call and talk things over — no obligation.

Please mention *Industrial Arts and Vocational Education*

THE STANDARD ELECTRIC TIME CO., SPRINGFIELD 2, MASS.
Founded 1884

(Continued from page 22A)

Dr. Micheels will have the title of Associate Professor of Trade and Industrial Education. He was awarded the B.S. degree at Stout in 1932, and the M.A. and Ph.D. degrees at Minnesota in 1938 and 1941.

Dr. Micheels has had broad experience in teaching and in other earning assignments, and has made significant contributions to our professional literature. During the war years he has served as assistant director of the teacher-training department, The Armored School, Fort Knox, Ky., and more recently as assistant director of personnel, Office of Defense Transportation, Washington.

APPOINTED TEACHER-TRAINING SUPERVISOR

Edward M. Claude has been appointed state supervisor of teacher training by the Board of Vocational Education, Springfield, Ill.

He is a graduate of The Stout Institute, Menomonie, Wis., and of Colorado State College, Fort Collins, Colo. He also took graduate work at the University of Florida, University of Alabama, and the University of Tennessee.

Mr. Claude taught printing for four years at Tampa, Fla., and in 1929 was appointed supervisor at the Brewster Vocational School, Tampa.

The following year Mr. Claude was made county supervisor of trade and industrial education at Daytona Beach, Fla., and served in this capacity for six years. He then assumed a similar position in Miami, Fla.

The next year he was appointed assistant state supervisor of trade and industrial education, and teacher training in Alabama. In this position he also supervised the apprenticeship and vocational diversified occupations programs throughout the state.

Then for five years Mr. Claude served with the U. S. Office of Education as special representative for the vocational training of war-production workers, and later as special agent on apprenticeship training.

Edward M. Claude

All of this wide experience has furnished an excellent background for the serious task that confronts him in his new position at Springfield, Ill.

DR. S. L. COOVER GOES TO CHILE

Dr. S. L. Coover, who has been head of the industrial-arts department at the State Teachers College, California, Pa., since 1930, has been granted a year's leave of absence to go to Chile as one of a small group of specialists in secondary education to work with the Chilean Government

Dr. S. L. Coover

in reorganizing its educational program. Dr. Coover's work will deal with industrial arts and vocational education.

He left for Chile on January 5, 1946. His headquarters will be Santiago. The educational project is being sponsored jointly by the Chilean Government and the Office of Inter-American Affairs, Washington, D. C.

Mr. A. J. Hoover who has been teaching metalwork and drawing at California State Teachers College for the past 10 years will assume Dr. Coover's duties while he is away.

OBITUARY OF ORVILLE HAYFORD

Orville Hayford, teacher of industrial arts at Washington Irving High School, Tarrytown, N. Y., and for more than a quarter of a century writer of poetry, a leader in the Boy Scout movement throughout this section, an outstanding member of the Asbury Methodist Church, and active in the civic and social life of Tarrytown, died at the Tarrytown Hospital, November 27, 1945, at the age of 52.

After attending the local schools at Rensselaer,

(Continued on page 26A)

AIRCO

Your supply depot for

oxyacetylene flame and electric arc equipment and supplies

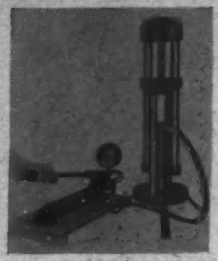
Gases

Airco Oxygen is produced and tested under the most rigid scientific procedures, and is guaranteed to be 99.5% pure in the cylinder. High purity assures maximum speed and economy in cutting, and greater efficiency in welding.

Airco Acetylene has been proved by use and tests to be the most economical fuel gas for pipe welding and other flame welding operations.

Other Airco gases such as Nitrogen, Hydrogen, Carbon Dioxide and the rare gases Argon, Neon, Helium, Xenon, and Krypton (and mixtures thereof) for commercial and laboratory use are available through a nationwide distribution system. Nitrogen and Oxygen may be obtained in liquid state and Carbon Dioxide in solid form.

National Carbide (in the red drum) is made from the finest available coke and limestone by the most modern manufacturing methods. It is evenly sized and dust-free, and gives a high, uniform yield of acetylene gas. Available in six sizes in 100 lb. and 25 lb. drums, and 2 lb. and 10 lb. cans.



Tensile Test Machine

Oxyacetylene Apparatus and Supplies

Airco manufactures and distributes a complete line of products for every oxyacetylene flame use. Among these many products are:

Airco Tensile and Bend Testing Machine: This newly designed machine permits rapid testing of weld specimens in shop, laboratory, or on field operations. Guided bend tests, transverse tension, and longitudinal all-weld metal tension tests are quickly made with this compact Airco machine.

Airco Hand Torches: Airco torches are made in a complete line of types for gas welding, cutting and many other oxyacetylene flame applications. Precision-made from the finest materials available, Airco torches have been noted for over 25 years for sturdiness, efficiency, and scientifically-balanced construction. A complete line of tips is also available.

Airco Gas Pressure Regulators: Airco gas pressure regulators are made in a wide range of styles for controlling gas pressures in cutting, welding, and other oxyacetylene processes. They are available in styles for use with oxygen, acetylene, hydrogen, nitrogen, carbon dioxide, and other commercial gases. Ruggedly constructed, accurate, and dependable, Airco regulators are designed to give long, reliable service.

Gas Welding and Cutting Supplies: Airco also provides a complete line of supplies for every oxyacetylene flame application—welding rods, flux, hose, goggles, gloves and many others. Whatever you need for gas welding and cutting, Air Reduction can meet your requirements promptly.

Arc Welding Machines, Electrodes and Accessories:

The Wilson "Hornet", famous for its smooth, steady arc, easy regulation, and reliable service, is ideal for general purpose DC welding. Made in 200, 300, 400 amp. sizes.

Wilson 200 Amp. "Bumblebee"

The Wilson "Bumblebee" AC welders (indoor and "All-Weather" models) are supplied in 300 and 500 amp. sizes and other AC units in 100, 200, 750 and 1000 amp. sizes.

A complete line of shielded arc AC and DC electrodes. Airco No. 78E and 79E are ideal for DC all-position, general purpose welding where excellent physical qualities are needed. Airco No. 87 is recommended for single or multiple pass DC or AC welding on rusty work and where fit-up is poor. Airco No. 230 is a "top-notch" electrode for all-position AC welding.

Arc Welding accessories include helmets, holders, cable, clamps, gloves, brushes, etc.

For additional details on any of these products, please contact the nearest Airco office. Or, if you prefer, address your inquiry to Dept. IAV at the home office.

AIRCO

AIR REDUCTION

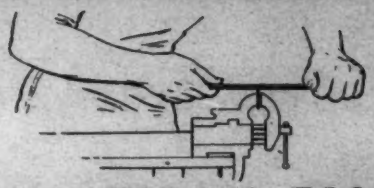
General Offices: 60 EAST 42nd STREET, NEW YORK 17, N. Y.

In Texas: MAGNOLIA AIRCO GAS PRODUCTS CO. • General Offices: HOUSTON 1, TEXAS

Offices in all Principal Cities

Represented Internationally by Airco Export

Filing Hints To Meet Your Needs



HOLD WORK TIGHT
for Better Filing

When filing, make sure the work is held tightly. For filing loosely-held work is asking for trouble. The file chatters over the surface, and file teeth are quickly distorted and dulled. That's why we say always mount the work tightly in a vise. Use protective pieces of soft metal between vise jaws and your work if it is apt to be damaged by pressure.

Generally, the vise should hold the work at about elbow level. Heavy work can be placed lower. Fine, delicate workmanship requires the material to be placed at eye level.

But heavy, coarse or fine, the filing can be done better, faster, more accurately with Heller NUCUTS. The Heller patented "wavy teeth" design of these files, with their alternating coarse and fine teeth, makes NUCUTS cut deep, clean and true, and levels the surface off smooth at the same time.

HELLER BROTHERS COMPANY
Newark, New Jersey • Newcomerstown, Ohio
America's Oldest File Manufacturers
Good Tools since 1836

Awarded to the Newcomerstown, Ohio, Plant.

HELLER NUCUT FILES
WAVY TEETH

(Continued from page 24A)

N. Y., where he was born, he entered the New York State Teachers College at Albany. He was graduated in 1915 from this institution, and later attended the graduate school at New York University. Mr. Hayford taught at the Utica Free Academy at Utica, N. Y., from 1915 to 1918, and then joined the faculty of Washington Irving High School, Tarrytown, N. Y., as teacher of industrial arts. He was active in the organization of defense facilities in the days when bombing was feared by the people of Tarrytown. He taught in the defense school, training many workers for the war plants.

In the field of poetry, Mr. Hayford contributed to many publications over a period of years and won recognition, being listed in *Who's Who of American Poets*, in 1939. He also received an award for his poetry at the World's Fair when it was held at New York.

♦ CAPTAIN M. DEAN, who has been on military leave of absence from the Lane Technical School, Chicago, for the past three and one-half years is now on terminal leave from headquarters, Fourth Army at Fort Sam Houston, Tex.

Capt. Dean was in command of a casual company in the China-Burma-India Theater and later commanded the 3474th ordnance company and the second and third echelon shops at Teheran, Iran. These shops were manned by both military and civilian personnel, and were equipped to assemble and service motor vehicles, small arms, field ranges, and other ordnance equipment for military installations within a radius of about 250 miles from Teheran.

Previous to entering the military service Capt. Dean was a member of the faculty at Lane Tech and served on the national defense training and placement program at the Illinois Institute of Technology. He has been active in the Illinois Vocational Association, having served as general chairman of the exhibits committee and, for a period of five years, as chairman of the auto and aviation section. For three years he served as coach of the automotive trouble shooting teams from Lane Tech which won seven first- and four second-place awards in the state-wide contests sponsored by the Illinois Vocational Association.

NEW ASSISTANT SUPERVISOR OF AGRICULTURAL EDUCATION

P. W. Proctor, who possesses a background of 23 years of successful teaching experience as instructor of agriculture at the Community High

P. W. Proctor

School, Pittsfield, Ill., and at the Township High School, Bellflower, Ill., has been appointed assistant supervisor of agricultural education, Springfield, Ill.

He is a graduate of the University of Nebraska, and took his graduate work at Colorado State College.

APPOINTED ASSISTANT STATE SUPERVISOR OF TRADE AND INDUSTRIAL EDUCATION

Fred W. Swan, former vocational printing instructor at Waukegan Township High School, Waukegan, Ill., has been appointed assistant supervisor of trade and industrial education, Springfield, Ill.

Fred W. Swan

He is a graduate of Illinois State Normal University and has done work at Lewis Institute, Crane Junior College, and graduate work at Ohio State University.

His experience covers both teaching and practical work in the graphic arts, and in his new position, besides his supervisory duties, he will have charge of the publications of the Illinois State Board for Vocational Education.

♦ ALFRED H. MOORE has been appointed associate professor and director of industrial arts at the East Tennessee State College, Johnson City, Tenn.

Mr. Moore received his B.S. degree at Western Kentucky Teachers College, Bowling Green, Ky., and a master's degree at the University of Missouri, Columbia, Mo.

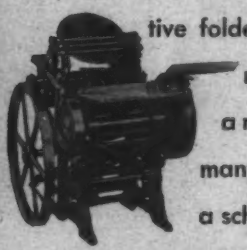
His teaching experience of over 14 years was acquired in the schools of Marion, Ky.; Middlesboro, Ky.; Bowling Green, Ky.; Baltimore County, Md.; Morehead College, Morehead, Ky.; and Peoria, Ill.

He organized the industrial-arts program at Bowling Green High School, and the course given to the electrician mates, third class at the Naval Training School at Morehead College. He was

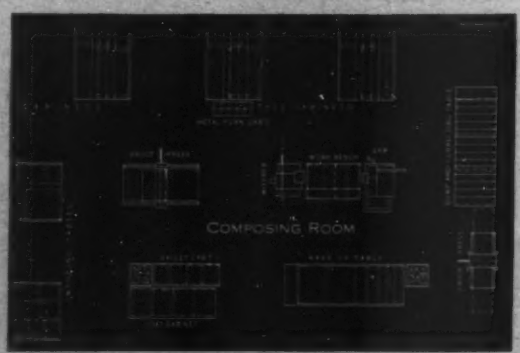
(Continued on page 28A)

Everything for the School Printing Department from ATF

We are able to supply school printing and graphic arts departments with *everything* required to carry on their activities. ATF takes justifiable pride in its ability to fully equip the Composing Room, the Pressroom and Bindery with all the many essential items required in these departments. Our service to school executives does not stop with supplying the physical equipment needed. Our Department of Education also has available instructive folders and booklets which simplify the many problems involved in initiating a new installation, or following through many helpful activities made possible by a school printing department.



Why a School Printing Department
is an Essential Department in an Industrial Arts Program



- It will integrate and vitalize the entire school program.
- It will provide for self-expression through creative experiences in English, art, and social studies.
- It will provide a powerful school publicity medium.
- It will motivate and coordinate all academic work.
- It will socialize the life and interests of students.
- It will emphasize "Learn by Doing."

For information about equipment, ideal floor plans and instructive literature, write to

AMERICAN TYPE FOUNDERS
Department of Education
200 ELMORA AVENUE, ELIZABETH 8, NEW JERSEY

(Continued from page 26A)

head of the mechanical shop department at the last named institution for two and one half years.

♦ VICTOR L. BOWERS, after nearly three years of service as training administrator at the San Antonio Air Technical Service Command, Kelly Field, Tex., has returned to his former position as chairman of industrial-arts education, Southwest Texas State Teachers College, San Marcos, Tex.

♦ DELMAS MOORE, formerly industrial-arts instructor at DeMotte, Ind., has been appointed instructor of industrial arts at Pleasantville, Ind.

♦ G. ELWOOD HOOKEY has been asked to direct the distributive occupations courses in the city schools of Terre Haute, Ind.

Mr. Hookey has a B.S. degree from Indiana State Teachers College, and the M.S. degree from Oklahoma A. & M. College.

♦ GLEN C. HENDERSON has retired after many years of teaching industrial arts at Woodburn, Ind.

♦ PROFESSOR V. P. MCKINLEY, head of the trade and industrial education department at the University of Alabama, retired on July 1, 1945.

He joined the university faculty in 1918, to head the teacher-training program for trade and industrial education.

Prof. McKinley was one of the earlier leaders in foreman conference work and vocational guidance, active in the industrial-education division of the Alabama Education Association, the Alabama Vocational Association, and the American Vocational Association. He helped to organize the A.V.A. trade and industrial teacher-training section and served as president for one year. A graduate of State Teachers College, Troy, Ala., Prof. McKinley also holds degrees from Teachers College, Columbia University.

RECEIVES APPOINTMENT AS ASSISTANT SUPERVISOR OF AGRICULTURAL EDUCATION

O. C. Holt, instructor of vocational agriculture for 13 years at Amboy, Ill., has been appointed

O. C. Holt

assistant supervisor of agricultural education, Springfield, Ill.

He is a graduate of the University of Illinois, and has his master's degree from Pennsylvania State College.

♦ DR. RICHARD D. ALLEN, assistant superintendent of schools in charge of research and guidance, Providence, R. I., died on August 23, 1945.

He was one of the pioneers in the guidance movement in the U. S., and has written a great deal on the subject.

Dr. Allen was the first consultant appointed to head up the Occupational Information and Guidance Service of the U. S. Office of Education in 1938.

He taught at Harvard, Yale, Boston, and Brown universities.

♦ KARL K. NELSON died at Newton, Kans., where he had been director of the evening program for 16 years. He served as instructor of industrial arts for 23 years.

♦ H. B. ADAMS, principal, Murray Vocational School, Charleston, S. C., died on July 7, 1945, in Richmond, Va. He had been active in vocational work for 25 years.

♦ DR. J. B. HOBDY, state director of vocational education for Alabama for the past 27 years, retired on July 1, 1945.

He is a graduate of Alabama Polytechnic Institute, and received his M.A. degree from the same institution. He earned his LL.D. degree at the University of Alabama.

Dr. Hobdy is a member of the Alabama Educational Association, member and past-president of the Alabama Vocational Association, life member of the American Vocational Association, and a member of the National Association of State Directors of Vocational Education.

♦ R. E. CAMMACK, who has been teaching vocational agriculture in Alabama since 1919, has been appointed state director of vocational education for Alabama to succeed Dr. J. B. Hobdy, who has retired.

♦ H. A. TIEMANN has accepted a position as educational director for the Colorado Public Service Co. with headquarters in Denver. Mr. Tiemann has been engaged in vocational work since 1919, and was state director of vocational education for Colorado, and later assistant superintendent of schools in charge of vocational education for San Francisco. He resigned this latter position to return to Colorado.

♦ WILLIAM S. MASON, distributive co-ordinator at Riverhead, L. I., has left Riverhead to accept a similar position in Washington, D. C.

♦ JAMES GILBREATH, director of the evening program in Chanute, Kans., has been appointed supervisor of the city's entire industrial education program.

♦ HOWARD CAMITSCH has been appointed instructor in sheetmetal work in the air-conditioning department of the Dunwoody Institute, Minneapolis, Minn.

♦ GEORGE C. DOCKEN has been appointed in-

(Continued on page 31A)

from THE MACMILLAN COMPANY
60 Fifth Avenue, New York 11

Vocational Texts that HELP THE TEACHER

Practical Marine Electricity

By S. N. LeCount and H. S. Dusenbery

Highly recommended by the Supervisor of Shipyard Training for the U. S. Maritime Commission "for all those who wish to make a career for themselves in marine electricity because it is simple, concise and complete, and contains the specific things a marine electrician must know." Written by practical men, this book provides a course that will produce *employable* workers. $3.50

SEND FOR COPIES ON APPROVAL

Let us send you copies of these texts to look over NOW, so that you will have time to requisition the number you will need for next terms' classes.

Principles of Radio for Operators

By Ralph Atherton

Clear, practical instruction in the operating principles of all parts of radio, including antennas, with full details about commercial equipment and procedures for construction, operation, and repair. The material is presented in units most convenient for class work. Many of the unusually effective teaching aids used in the intensive Navy training are included. $3.75

Machine Shop Operations

By Lewis E. King

Published:
LATHE OPERATIONS; MILLING MACHINE OPERATIONS.
Each $1.75

Coming:
SHAPER OPERATIONS; BENCH OPERATIONS; GRINDER OPERATIONS

Written by the head of the Machine Shop Department in the Detroit Aero Mechanics Vocational High School, these manuals supply the technical information and guidance needed to keep all the students in a shop class working effectively all of the time. Their complete instruction on the machine and its parts, on setting the machine and the work for each operation, and on the various "tricks of the trade" insure good work without waste or damage.

Shop Job Sheets in Radio

By R. N. Auble

Book 1: Fundamentals; *Book 2:* Service Problems.
Each $1.50

Used in Signal Corps training, the material in these shop manuals has been perfected for the most thorough and practical kind of training. Step-by-step exercises, each accompanied by large clear diagrams, in the practical application of electrical principles to the various radio components, in the use of the serviceman's tools, and in the actual construction of power supplies, amplifiers, receivers and transmitters.

Introduction to Practical Radio

By D. J. Tucker

Gives the beginner the *thorough* knowledge of the *indispensable* essentials he must have for any kind of radio work. Written in the simplest, clearest English, with helpful explanations of the necessary mathematics at the points where it is needed. $3.00

Engineering Preview

By L. E. Grinter and Others

Widely recommended by admissions advisers in engineering colleges as an excellent guide and preparation for high school students. Gives a complete "preview" of the basic work and skills required in engineering or technical work. $4.50

Aerodynamics *By L. R. Parkinson*

An excellent introduction to this subject for high school students, simply written, covering all essentials, and including much practical reference data. $2.25

To be published this winter

Aircraft Woodwork

By R. H. Drake

Gives all the practical instruction and information needed to obtain an aircraft mechanics license in woodwork, including the necessary background knowledge of woods as well as complete instruction in the use of woodworking tools, glues, dopes, etc.; in blue-print reading; and in the step-by-step construction and repair of the various wood and fabric-covered parts of aircraft. . $3.50 *(Probable)*

Plastic Craft

By E. S. DeWick and John Cooper

Prepared by teachers who have instituted plastics work in hundreds of schools, this is a richly illustrated how-to-do-it book on handcraft work in plastics suitable for use in any kind of shop—metal, wood, or general. Complete information on modern plastic materials and over 100 projects offering the teacher a wide choice according to the tools available.
$4.25 *(Probable)*

Delight Your Class

WITH PROJECTS IN PLASTICS

How your students will enjoy working with plastics! Crystal-clear, easily carved, cut and shaped, plastics will enable them to produce finished products of true professional appearance, that will bring exclamations of admiration from friends and parents.

We can supply you with Plexiglas, Lucite, Bakelite, Tenite II, Lumarith, Lignolite, and other plastics in sheets, rods and tubes especially suited for the school workshop. Also available are project plans and complete fabricating information.

Send today for catalog, sample working drawings of six projects, and full details. Address Dept. 2V.

CARMEN-BRONSON CO.
165 EAST 3RD ST., MT. VERNON, N.Y.

"Education interprets the past, enriches the present, plans the future."

MINNESOTA SUMMER SESSION

Department of Industrial Education
COLLEGE OF EDUCATION
Separate Enrollment for Either or Both Terms
June 17—July 27 or July 29—August 31

FOUR-YEAR CURRICULUM—B.S. DEGREE
MASTER'S DEGREE—PLANS A-B-X-Y
INDIVIDUAL PLANS FOR PH.D. DEGREE
INDUSTRIAL ARTS AND SMITH-HUGHES, GEORGE-DEEN COURSES
EXCELLENT LIBRARY FACILITIES
UNEXCELLED RECREATIONAL PROGRAM
WIDE RANGE OF MANIPULATIVE COURSES

Correspondence concerning undergraduate work and graduate patterns may be addressed to the Department of Industrial Education, 200 Eddy Hall.

The Dean of the Graduate School, 234 Administration Building, will supply a Bulletin of General Announcement and a blank of "Application for Admission."

Bulletins of the Summer Session may be obtained from the Director of Summer Session, 773 Administration Building.

UNIVERSITY OF MINNESOTA
MINNEAPOLIS 14, MINNESOTA
76th Year of Service

The 1946 SHOP ANNUAL of *Industrial Arts and Vocational Education*

The authoritative source of information and guidance in organizing, planning, and equipping school shops.

READY FEBRUARY 15, 1946

The SHOP ANNUAL NUMBER summarizes the periodic progress in the field of industrial arts and vocational education, emphasizes the new developments ahead, presents through actual shop layouts and equipment lists, the best methods of accomplishment in the school shop field. The service of the SCHOOL SHOP ANNUAL NUMBER (regular March issue) of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is

1. It renders a comprehensive service promoting the introduction, progress, and expansion of industrial arts and vocational education.
2. It provides an authoritative source of information and guidance in organizing, planning, and equipping school shops.

Single Copies $1.00—Yearly Subscription, including Shop Annual Number, $2.50

THE BRUCE PUBLISHING COMPANY
Publishers
1245 Montgomery Bldg., Milwaukee 1, Wis.
NEW YORK CHICAGO

Examine these new books for your classes

Automotive Mechanics — By William H. Crouse, Field Service Engineer, Delco-Remy Division of General Motors, Anderson, Indiana.

Offers a new approach, covering all phases with a step-by-step treatment. Comprehensive trouble-shooting sections. Latest designs and practices. A correlated film bibliography. In press.

Workbook in Mechanical Drawing — By Shriver L. Coover, Director Industrial Arts Teacher Education, State Teachers College, California, Pa.

Makes mechanical drawing really *functional* for beginning students. Projects and problems of general interest take the place of meaningless exercises and engineering problems. Geared throughout to the needs and interests of beginners. In press.

Send for copies on approval

McGRAW-HILL BOOK COMPANY, Inc.
330 West 42nd Street New York 18, N. Y.

(Continued from page 28A)

structor in watchmaking at the Vocational School, St. Paul, Minn.

♦ Recently appointed directors of Wisconsin schools of vocational and adult education are: H. M. CLARK, Kenosha; CHARLES ROWE, Rhinelander; RALPH J. KEEN, Beloit; and W. F. OWENS, Ashland.

♦ E. L. MEADER has been appointed assistant director and co-ordinator of industrial, adult, and veteran education, at Wichita, Kans.

♦ CHARLES F. ZINN, chief, trade and industrial education of the state of Pennsylvania, resigned to become director of vocational education, Chester, Pa.

♦ H. R. CULVER, Ft. Payne, Ala., vocational agriculture teacher, succeeds J. C. Cannon as associate state supervisor of vocational agriculture. Mr. Culver's special responsibility will be northeast Alabama.

L. L. SELLERS, district supervisor in southeast Alabama, will also serve as associate supervisor.

♦ C. W. ILLINGWORTH, formerly with the Racine School of Vocational and Adult Education, Racine, Wis., and more recently WPTP supervisor, has accepted a position with the Veterans Administration in Wisconsin.

♦ J. C. CANNON, formerly associate supervisor of agricultural education of the State of Alabama, has been appointed supervisor of agricultural education for that state.

♦ GEORGE D. LOBINGIER has been appointed supervisor of student recruitment, and Delmar W. Karger as supervisor of scholarships and graduate study, of the educational department, Westinghouse Electric Corp., Pittsburgh, Pa.

♦ ROBERT L. ISBELL has been appointed industrial co-ordinator for the school system at Attica, Ind.

Association News

A.V.A. CONVENTION IN BUFFALO

Plans are now in the process of final completion for the American Vocational Association Convention. All present indications point to this being the largest assemblage of vocational, industrial education, and industrial-arts instructors, supervisors, and directors in the history of the organization. More than 3000 persons from the 48 states of our country will be attracted to these meetings.

The convention headquarters will be at Hotel Statler, Buffalo. Here, both general meetings and sectional meetings will be held. The sectional meetings will cover all phases of vocational and industrial education. Among the various sections will be the following: vocational and industrial education, vocational guidance, veteran training, adult training, commercial education, part-time education, agriculture, home economics, industrial arts, teacher training, technical education, engineering training, teacher training for industrial education and industrial arts, and distributive education.

To date, an outstanding selection of speakers have been secured for the convention. Three of the most important topics which will be discussed at practically all of the sectional and general meetings will be concerned with:

1. The problem of the veteran;
2. The problem of training and retraining for peacetime pursuits;
3. The problem of the tremendous number of "dammed up" youth unable to secure jobs at an early age.

The convention will prove to be a focal point where a thorough presentation and discussion of these problems can be made. It is hoped that our thinking will be stimulated and in turn our educational programs vitalized, practicalized and be better patterned to meet the present and future situation.

Arrangements have been made so that all persons attending the convention will have the opportunity to visit the various schools in Buffalo. Special trips by bus have been planned to transport interested parties to the various vocational, technical, and academic high and elementary schools. In addition to this special tours to Niagara Falls will be conducted. No visit to Buffalo is complete without seeing the falls. It is at this time of the year, when Niagara Falls is in its icy glory, a sight that will never be forgotten.

At convention headquarters a large section has been set aside for displays of book publishers and manufacturing concerns. These should prove of interest to all educators. — Norton W. Ruth, Boys Vocational High School, Buffalo, N. Y.

Industrial-Arts Sectional Meetings at the A.V.A. Convention

Frank C. Moore, Vice-President
Industrial-Arts Education

For some years it has been my privilege to attend and take part in the industrial-arts sectional meetings of the American Vocational Association. They have always been well attended; in fact, have been one of the largest sectional groups holding meetings in connection with this convention.

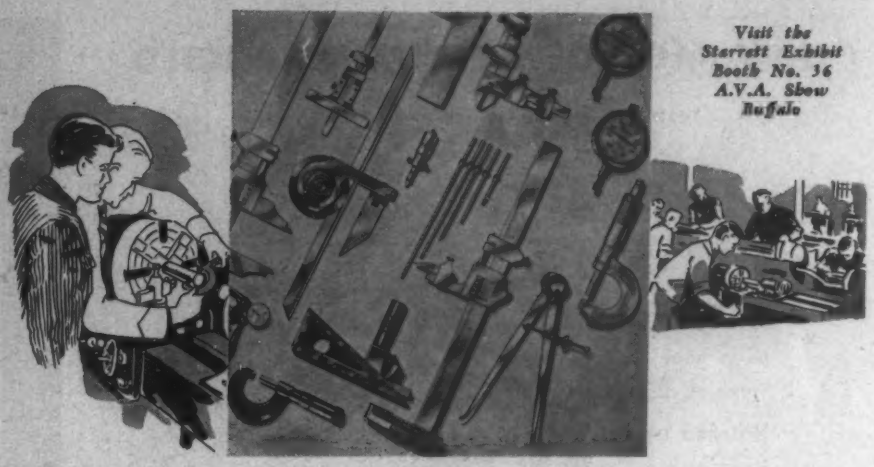
For the Buffalo convention of 1946, Roy Fales, state supervisor of industrial arts, State of New York, is program chairman. Mr. Fales is a life member of the A.V.A. He is gathering together outstanding speakers from all over the country to discuss pertinent topics relative to industrial-arts education.

The theme of the program for industrial-arts discussions this year is "evaluation of Community and Pupil Needs."

There will be four sectional meetings. The first, held on Thursday morning, February 7, will be centered around industrial-arts research. Thursday afternoon the program will center around industrial-arts teacher training. Friday afternoon's program will be on the subject of industrial arts at various levels. Saturday morning's program has not been completed as yet, but will have a definite appeal to the classroom teacher.

The program, as far as completed, follows:

(Continued on next page)



Visit the Starrett Exhibit Booth No. 36 A.V.A. Show Buffalo

No finer example of ACCURATE WORKMANSHIP

What better way to give trainees an appreciation of accuracy and fine craftsmanship than to let them work with Starrett Precision Measuring Tools. Not only do they have right in their hands the finest example of quality and precision craftsmanship in the toolmaker's art but, these same fine tools will inspire them with confidence and pride in their own work.

It pays to start your students with Starretts — the first choice of men who know and use fine tools.

THE L. S. STARRETT CO., ATHOL, MASSACHUSETTS, U. S .A.

World's Greatest Toolmakers

STARRETT TOOLS

Precision Tools... Dial Indicators... Ground Flat Stock... Hacksaws... Metal Cutting Band Saws... Steel Tapes

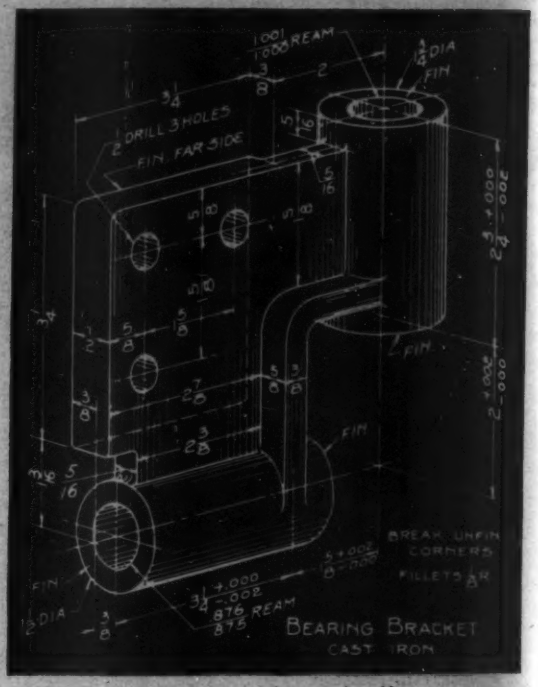
"THEY PROVIDE WELL-CONSTRUCTED DRAWINGS!"

That's the opinion of mechanical drawing instructors about Dixon's original and exclusive Eldorado Blueprint Series.

Use these helpful problems yourself! This month, have your students draw the correct orthographic views of this Bearing Bracket.

But first equip them with Typhonite Eldorado *easy drawing* pencils. Their non-feathering, non-crumbling leads make clear, brilliant, dense lines everytime—and on every job.

Next month—a new problem. Look for it here!



SOLUTION: We'll be glad to send you a free blueprint showing the solution of this problem. Write to the address below within thirty days. Specify Blueprint No. 128-J2.

DIXON'S TYPHONITE ELDORADO

SCHOOL BUREAU, PENCIL SALES DEPT., JOSEPH DIXON CRUCIBLE COMPANY, JERSEY CITY 3, N. J.

(Continued from previous page)

Thursday morning, February 7 — *Industrial Arts Researches*

Chairman: Arthur Mays, Urbana, Ill.

1. "Life Situations as a Factor in Planning Drawing Courses," Clyde Bowman, Menomonie, Wis.

2. "Outstanding Teachers Activities," G. Harold Silvius, Detroit, Mich.

3. "Aeronautics in Industrial Arts," E. E. Ericson, Santa Barbara, Calif.

Discussion Leader: Homer Smith, Minneapolis, Minn.

Thursday afternoon — *Industrial-Arts Teacher Training*

Chairman: Frank C. Moore, Cleveland, Ohio.

1. "Selection of Students," T. A. Hippaka, Ames, Iowa.

2. "Types of Training," George Cox, Corvallis, Ore.

3. "Industrial Experience," Lawrence Ashley, Yonkers, N. Y.

Discussion Leader: Gordon Wilber, Oswego N. Y.

Friday afternoon, February 8 — *Industrial Arts at Various Levels*

Chairman: Roy G. Fales, Albany, N. Y.

1. "Elementary Industrial Arts," Carl H. Hamburger, Cleveland, Ohio.

2. "Junior High School Industrial Arts," Stanley Pawelek, Baltimore, Md.

3. "Senior High School Industrial Arts," J. Osborne Johnson, Denver, Colo.

Discussion Leader: Louis V. Newkirk, Chicago, Ill.

Saturday morning, February 9 — *Demonstrations of New Materials*

Chairman: Stewart F. Ball, Buffalo, N. Y.

1. "Ceramics for Boys," Edgar Strong, Geneva, N. Y.

2. "Cutting and Polishing Stones" (lapidary work), C. A. Blacklin, Burlington, Wis.

We in the field of industrial arts feel that the American Vocational Association has something to offer us and that we definitely have something to offer the members of the American Vocational Association. We sincerely hope that the industrial arts instructors, the country over, are making arrangements to attend the convention so that they may take part in the program and help in the solution of the industrial-arts problems for the year 1946.

♦ The Fourth Annual Conference of the Canadian Section of the Plastics Industry will be held at the General Brock Hotel, Niagara Falls, Ont., Canada, on February 6 and 7.

At this conference the most recent developments in the plastics field, plus the lifting of wartime secrecy on materials developed during the past six years will be fully discussed.

New machinery, including molding equipment, toolroom equipment, and fabricating equipment, coupled with newly developed techniques to further the interests of the entire industry will mark another phase in the two-day discussion.

There also will be a report by one member of the Canadian "Plastics Team" who toured Germany recently studying the plastics industry in the Reich.

News Notes

♦ The production of a series of films in cartoon form, especially planned for use in schools, has been announced by Pictorial Films, Inc., 1270 Sixth Ave., New York City.

The first two in this series will be titled "Good Manners" and "Good Health." These films are planned to appeal to children of all ages and to teach a lesson as only cartoons can.

♦ The first six titles in a series of vocational guidance books for high-school and college students have just been released by Vocational Guidance Manuals, Inc., 45 West 45th St., New York 19, N. Y. The books are: *Opportunities in Acting — Stage, Screen, Radio, and Television*, by Frank Vreeland; *Opportunities in Public Relations*, by Shepard Henkin; *Opportunities in Journalism*, by Elias E. Sugarman; *Opportunities in Radio*, by Jo Ranson and Richard Pack; *Opportunities in Architecture*, by William Thorpe; and *Opportunities in Free-Lance Writing*, by Hazel Carter Maxon.

♦ The International Harvester Co. recently announced the establishment within the company of a new, comprehensive program of education and training, and a co-operative arrangement with the University of Chicago for the development and carrying out of a thorough program for the better instruction of its many thousands of employees.

In order to put this program into effect with minimum delay, a temporary instruction center devoted largely to training key sales personnel will be opened in Chicago just as soon as a building for which the company is negotiating is vacated by its present occupant. This centralized educational program will be supplemented by educational and training programs carried on at all of the more than 100 company branches in the United States, so that specialized education and training can be brought directly to the largest group of sales personnel.

At the same time, present factory training programs will be expanded and intensified so that the manufacturing personnel will also enjoy the advantages of the new activity.

♦ "Working Together for Ohio's Schools" presents the conclusion of the members of the Second Miami Workshop, that the solutions to the problems of education in Ohio can only be found through the closest possible co-operation of the school people and the public. The report is a discussion of ways to make this co-operation stronger and more effective.

The report may be obtained at 50 cents each for 1 to 10 copies. Reduced prices for larger quantities. Address orders to the Miami Work-

(Continued on page 34A)

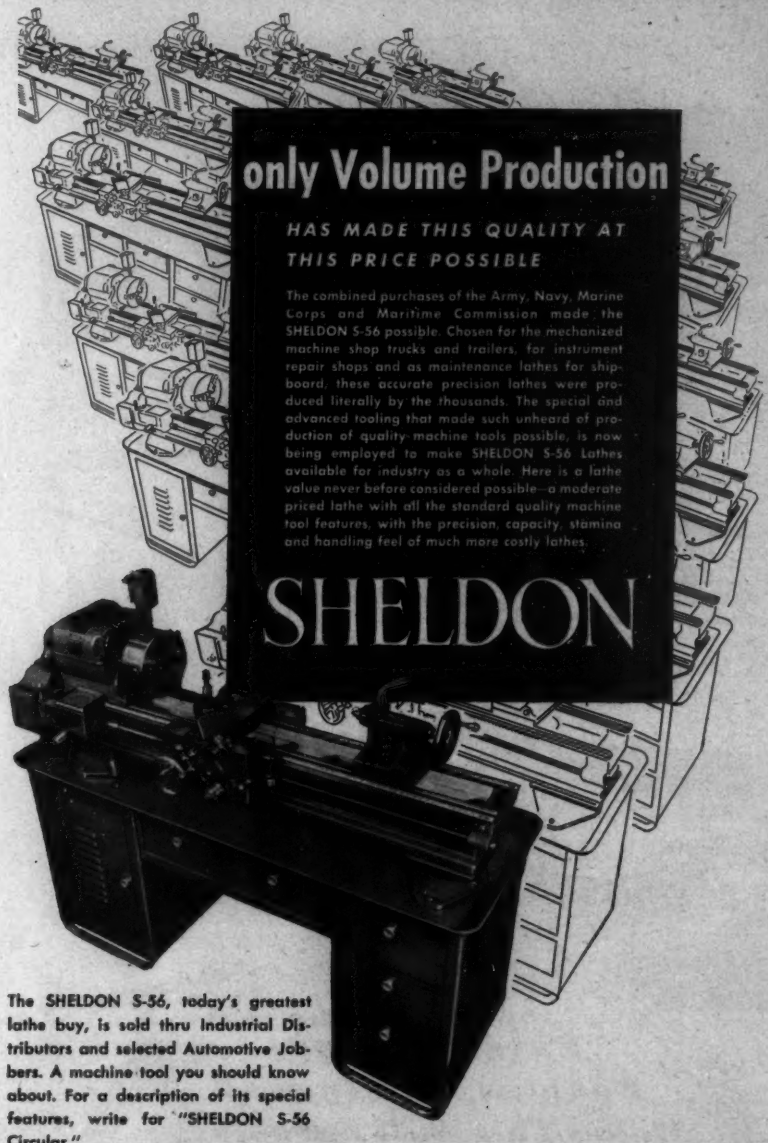
EXT.-D.F.P.A.
TRADE MARK REG. U. S. PAT. OFF.

Only Exterior type Douglas fir plywood should be used in marine construction. It's made with completely waterproof glues and each panel is identified by the "grade trade-mark" shown above.

Exterior-Type Douglas Fir Plywood Makes This Skiff Durable ... and Easy for Students to Build!

Douglas fir plywood helps students build many things better—and faster. It's easy to work either by hand or with power tools. It bends without breaking, can't be split or punctured. The large, rigid, light-weight panels of Exterior-type plywood make it possible for students to build sturdy, durable, good-looking boats of all kinds. This 11-½ foot Monk-designed skiff is one of them, particularly suited to classroom work. Plans are available without charge. Write for Boat Plan 22.

DOUGLAS FIR PLYWOOD ASSOCIATION
Tacoma 2, Washington


only Volume Production
HAS MADE THIS QUALITY AT
THIS PRICE POSSIBLE
The combined purchases of the Army, Navy, Marine Corps and Maritime Commission made the SHELDON S-56 possible. Chosen for the mechanized machine shop trucks and trailers, for instrument repair shops and as maintenance lathes for shipboard, these accurate precision lathes were produced literally by the thousands. The special and advanced tooling that made such unheard of production of quality machine tools possible, is now being employed to make SHELDON S-56 Lathes available for industry as a whole. Here is a lathe value never before considered possible—a moderate priced lathe with all the standard quality machine tool features, with the precision, capacity, stamina and handling feel of much more costly lathes.
SHELDON

The SHELDON S-56, today's greatest lathe buy, is sold thru Industrial Distributors and selected Automotive Jobbers. A machine tool you should know about. For a description of its special features, write for "SHELDON S-56 Circular."

SHELDON MACHINE CO., INC.

4244 N. Knox Avenue Chicago 41, U. S. A.

Builders of Good Lathes Since 1919

(Continued from page 32A)

shop Committee, College of Education, Kent State University, Kent, Ohio.

♦ Four one-week courses in the first half of the 1946 School of Spray Painting conducted by The DeVilbiss Co., Toledo, Ohio, will be devoted to industrial finishers. Free to users of DeVilbiss spray-painting equipment. These courses will be identical in classroom instruction and shopwork. Scheduled starting dates are January 14, March 11, April 8 and June 10.

DeVilbiss urges industrial finishers interested to write for reservations at least two weeks in advance of any session.

♦ Coast Guard boot training has been cut from 12 to 8 weeks for recruits who qualify to attend specialist schools at the end of their basic course, according to an announcement today from the Chicago recruiting office, 610 S. Canal St. Formerly boot training lasted 12 weeks.

In the future a week's leave will be given at the end of boot training, both to men going out on general duty and to those continuing their preparation in radio, electricity, and aviation schools.

Two-year enlistments in the regular Coast Guard are now open to men 17 through 25 who pass physical and mental qualifying tests. Processing in the local office takes one day, and approximately 10 days later, accepted candidates are sworn in and transferred to Curtis Bay, Md., for training.

♦ The George Westinghouse Scholarship contest has been opened to every senior high school boy in the United States, it was announced by the Westinghouse Electric Corporation, sponsor of the awards.

Ten co-operative work-learn scholarships will be awarded for an engineering education at the Carnegie Institute of Technology. Formal engineering education is combined with practical industrial experience. The co-operative course requires five full years of work. Eight semesters are spent in school and two years are devoted to obtaining practical experience and applying engineering fundamentals in the Westinghouse plants.

The scholarships are valued at $1,850 each plus two years of wages earned during the working periods.

Applications for the scholarships will be accepted until February 1, 1946. Contestants must have good scholastic records in high school, and be able to meet Carnegie Tech entrance requirements.

The scholarship tests will be administered by the College Entrance Examination Board in all parts of the country on April 6.

On May 6 the ten awards will be made, and the winners will begin their studies at Carnegie Tech in June.

For further information address Westinghouse Editorial Service, 306 Fourth Ave., P.O. Box 1017, Pittsburgh 30, Pa.

♦ The effect of the war on graduate research is made evident by an examination of figures representing the annual totals of doctoral dissertations accepted by American universities since 1941. These figures are brought out in *Doctoral Dissertations Accepted by American Universities* (No. 12. 1944–45, The H. W. Wilson Company. 1945. $1.50). In 1941 the number had reached the all-time high of 3526, but since then yearly totals have declined steadily and the figure for 1945 is 1576.

Eighty-seven institutions recorded doctoral dissertations accepted during the past academic year. These are duly recorded in this volume in the format which has been set down in previous years. In addition to the main classified list, the alphabetical subject index, publication and preservation of American doctoral dissertations (Table 1); list of periodic university publications abstracting dissertations, and statistical tables showing distribution of doctorates by university and by subject, are continued in this volume as in previous years.

For further information, address The H. W. Wilson Company, 950-72 University Ave., New York 52, N. Y.

♦ A public opinion survey released by the National Opinion Research Center, University of Denver, has elicited the following responses to the query "What is one of your favorite ways of spending your spare time?"

41 per cent say they prefer *reading* or a combination of reading and other activities.

16 per cent indicate their interests are in *arts, crafts,* or *fine arts,* such as playing the piano, attending musical entertainments.

11 per cent choose *sports* and out-of-doors activities.

10 per cent say they like to spend their spare time attending the *theater, movies,* or *concerts.*

9 per cent mention listening to the *radio* or playing *records.*

13 per cent mention *other activities*: lectures, study courses, extension work, clubs, or church work.

People's reading interests vary to some extent according to their education, sex, and age. Reading is listed as a favorite diversion by 62 per cent of the college group, 43 per cent of the high school group, and only 33 per cent of the grade school group. Likewise 41 per cent of those with a college background, but only 13 per cent of those who have not gone beyond grade school, spend at least an hour a day reading *books.* However, more than half of persons in all three education groups spend an hour a day or more reading *newspapers and magazines.*

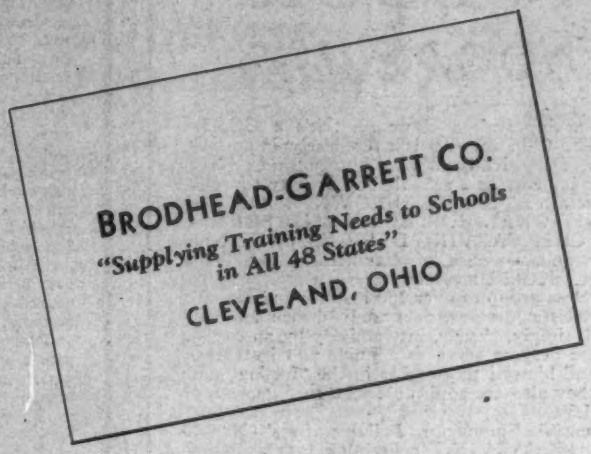
About the same proportion of men as of women like to spend their spare time reading; however, significant differences appear in their reading tastes. Women tend to spend more time reading books than men do, while men spend considerably more time than women reading newspapers and magazines. For example, 21 per cent of the men interviewed, in contrast to 14 per cent of the women, spend two hours a day or more reading newspapers and magazines.

Little difference is shown between younger and older adults in their liking for reading. Persons 40 and over spend somewhat less time than those under 40 reading books and somewhat more time reading newspapers and magazines.

Interviewers talked with a cross section of adult population in each of the 17 cities whose public

(Continued on page 36A)

Do You Know the



IF you have a training department, or are planning on adding one, or enlarging your present one, here are five good reasons why it will pay you to get acquainted with the Brodhead-Garrett Co:

1. BRODHEAD-GARRETT CO. is national school supply distributor for America's leading machine, equipment and supply manufacturers.

2. BRODHEAD-GARRETT CO. service is nation-wide, serving schools in all 48 states—the country's largest distributor of vocational and industrial arts and supplies.

3. BRODHEAD-GARRETT CO. service is comprehensive, offering more than 10,000 items in school training equipment, supplies and machinery.

4. BRODHEAD-GARRETT CO. personnel is trained from long years experience in intelligently supplying school needs.

5. BRODHEAD-GARRETT CO. offers not only one-source purchasing, but also expert planning service for schools preparing to establish training departments.

P. S. If you haven't the BRODHEAD-GARRETT CO. catalog, send for your copy today.

IT'S Fellowcrafter's NEW BROWN BOOK

CHIP CHIP HOORAY!

Chip carving isn't a chore . . . it's a CHALLENGE. Chip carving is a definitely important branch of creative handiwork in wood, now given greater impetus as a school shop activity through Fellowcrafters' No. 9957 BROWN BOOK OF TRADITIONAL EUROPEAN AND POLNESIAN CHIP CARVING DESIGNS, by Dr. Ivan H. Crowell, Director of Handicrafts, Mcdonald College, McGill University.

A priceless group of over 100 historic and racially characteristic designs, accurately drawn and described, simply, clearly, instructively by an expert in the ethnology of crafts. These designs serve as a guide and instructor for the student who would ground himself thoroughly in the "feeling" and execution of fine chip carving; they also are applicable wherever geometric motifs are required. Per Copy $1.50.

AND, the Brown Book's Indispensible Companion: Fellowcrafters' (McGill Series) Handbook No. 9956 CHIP CARVING, containing best available directions and instructions for chip carving. Per Copy $.20.

PROFESSIONAL TYPE TOOLS FOR CHIP CARVING

2804A—DOMESTIC SLICING KNIFE with surgical steel blade $1.00

2805A—DOMESTIC STICKING KNIFE with surgical steel blade $..90

(Please add postage to above prices)

FELLOWCRAFTERS' DISTRIBUTORS LIST

Atlanta 1, Ga., Milton Bradley Co., of Ga., Inc., 304 Forrest Ave., N. E.
Boise, Idaho, The Book Shop, 319 N. 8th St.
Boston 15, Mass., Gledhill Bros., Inc., 563 Beacon St.
Boston 16, Mass., Fellowcrafters, Inc., 130 Clarendon St.
Cedar Falls, Iowa, J. S. Latta & Son
Chicago 10, Ill., Chicago Craft Service, Craft House, 615 No. LaSalle St.
Cincinnati 2, Ohio, A. E. Wilde Co., 130 W. 7th St.
Cleveland 13, Ohio, Cleveland Leather Co., 1317 W. 28th St.
Dallas 1, Tex., Handicraft Supply, 400 No. Akard St.
Denver 2, Col., H. H. Meininger Co., 409 Sixteenth St.
Detroit 26, Mich., Detroit Leather Co., 894 Michigan Ave.
El Paso, Texas, Fenwitt Leather Co., 208 So. Stanton St.
Honolulu, Hawaii, T. H., H. K. Young Co., 7 No. Pauahi St. (P. O. Box 1556)
Indianapolis, Ind., Kiger & Co., 52-54 W. New York St.
Los Angeles 58, Cal., Schwabacher-Frey Co., School Supply Division, 736-738 So. Broadway
Louisville 2, Ky., Central School Supply Co., 311 W. Main St.
Nashville 3, Tenn., Nashville Products Co., 136 2nd Ave., N.
New Orleans 15, La., National Craft & Hobby Shop, 6835 Magazine St.
New York, N. Y., New York Central Supply Co., 62 Third Ave.
New York 7, N. Y., Warren Sales Co., Inc., 28 Park Pl.
Oklahoma City 2, Okla., Dowling's Second and Broadway
Philadelphia 6, Pa., Garrett-Buchanan Co., School Supply Dept., 12-20 So. 6th St.
Phoenix, Ariz., Peterson-Brooke-Steiner & Wist, Div., Amer. Seating Co., P. O. Box 551
Portland 4, Ore., J. K. Gill Co., 408 S. W. 5th Ave.
Richmond 20, Va., Flowers School Equipment Co., 327 W. Main St.
St. Paul 1, Minn., St. Paul Book & Stationery Co., 55-57-59 East Sixth St.
Salt Lake City 1, Utah, Utah Idaho School Supply Co., 155 So. State St.
Syracuse 2, N. Y., Vardeon's, Inc., 543-45 E. Genesee St.
Canada, Toronto, Lewis Craft Supplies, Ltd., 8 Bathurst St.

Fellowcrafters INC. 130 CLARENDON ST BOSTON 16 MASS

(Continued from page 34A)

libraries co-operated with the American Library Association. The following cities were included: Atlanta, Baltimore, Buffalo, Chicago, Detroit, Hartford (Conn.), Houston, Kansas City (Mo.), Louisville (Ky.), Milwaukee, Newark, Philadelphia, Pittsburgh, Portland (Ore.), St. Louis, San Francisco, and Seattle.

The report is based on 2114 interviews.

♦ Men wishing to enlist in the United States Coast Guard must now apply at the Recruiting Office, 610 S. Canal St., Chicago, Ill.

Enlistments in the men's reserve were terminated soon ofter V-J day, but applicants are still being accepted for regular service. The requirements for 17-year-old youths remain the same. They include two years of high school, at least 20/30 eyesight uncorrected, and good physical condition.

Men wishing to enlist must apply, in person or by mail, at least three weeks before their eighteenth birthday, and must present a certified copy of their birth certificate. They must obtain parents' consent before being sworn in.

Other recruiting stations in the Ninth Naval District are located in Detroit and Cleveland.

♦ Adjudicators to assist veterans in adjustment of claims are wanted throughout Illinois and Wisconsin. The adjudicators will be assigned from the Veterans Administration headquarters at Hines, Ill., and Wood, Wis.

To qualify for this position the applicant should have some experience in adjusting claims for insurance companies or with state or federal unemployment compensation agencies. Military experience in serving as a member of courts martial is also considered important as experience by the Commission. Either veterans or non-veterans may apply. The job pays a basic salary of $2,980 a year. At present the Veterans' Administration is working on a 48-hour week, eight hours overtime. With the overtime the salary amounts to $3,274 a year.

Application forms may be obtained at the regional office of the U. S. Civil Service, 433 W. Van Buren St., Chicago 7, Ill., or at any first or second class post office.

♦ Plans have been made and approved for the construction and equipment of industrial-arts shops for the Lincoln High School, Manitowoc, Wis. This school was built in 1923-24 but no provision was made for a program of industrial arts. The present plans call for a woodworking shop, machine shop and sheet metal, auto and aviation mechanics, and an electrical shop. The present drafting room in the main building will remain there. Some of the machinery for the shops is now being secured from the surplus property of the government.

The board of education of Manitowoc also has approved the establishment of a vocational agriculture course in connection with Lincoln High School. It is planned to start the course in September of 1946.

♦ Youths 17 to 26 may now enlist for a two-year period in the Coast Guard, Recruiting Headquarters, 610 South Canal St., Chicago, has announced.

Grammar school graduates, who successfully pass a mental aptitude test and physical examination, are eligible for enlistment. All applicants must present birth certificates.

Opportunities for special training in aviation and communications are open to men upon completion of three months' basic indoctrination at Curtis Bay, Md. Ratings now obtainable include aerographer's mate, aviation machinist's mate, radioman, radarman, electrician's mate, pharmacist's mate and approximately a dozen others. Monthly pay ranges from $160 to $250 a month.

♦ The National Conference of Christians and Jews announces the thirteenth annual observance of national Brotherhood Week to occur February 17-24, 1946. The theme is: "In Peace as in War — Teamwork." Program aids for use in schools and colleges may be secured by writing to the National Conference of Christians and Jews, 381 Fourth Ave., New York 16, N. Y. Materials are adapted to age levels in the schools. Plays, comics, posters, book lists, and other types of literature are available.

♦ Helpful information for those interested in the occupation of the Veterans' Counselor will be found in a six-page leaflet just published by Occupational Index, Inc., New York University, New York 3, N. Y.

♦ The November issue of the *Non-Ferrous Forgings Digest*, official publication of the Brass Forging Association, 420 Lexington Ave., New York, is a souvenir edition portraying the part brass and aluminum forgings played in the war armored equipment which the army, navy and air corps of the United States and other of the United Nations used in their victory against our enemies. The Digest is well illustrated by photographs of forgings used during World War II. Other interesting news pictures showing equipment in which these forgings were used were taken by Acme, United States Coast Guard, United States Navy, A.A.F., European and the Army Signal Corps.

The Digest, published by The Brass Forging Association, graphically illustrates the part nonferrous forgings played in the war and the part they will play for peacetime products.

♦ Government hospitals in and around Chicago are so desperately in need of civilian help that Joseph A. Connor, regional director for the U. S. Civil Service Commission, is today posting notices in post offices throughout Illinois, Wisconsin, and Michigan, appealing for hospital and mess attendants and laundry workers to carry on the important work of caring for the sick and wounded heroes in these hospitals.

Applications may be filed at the regional office of the U. S. Civil Service Commission, 433 W. Van Buren St., Chicago 7, Ill. Application forms may be obtained at any first or second class post office in Illinois, Wisconsin, or Michigan.

♦ The towns of Bethany, Cheshire, and Prospect, Conn., have purchased a 33-acre site upon which they will erect a six-year high school

(Continued on page 38A)

SHARP and CLEAR!

SVE

SLIDEFILM PROJECTORS

Show Details in Full Brilliance

Sharp, bright screen images are the rule when you visualize lessons with S.V.E. Projectors. S.V.E. Tri-Purpose Projectors which project single and double frame film strips, as well as 2″x2″ miniature slides are now available to schools and churches. S.V.E. also offers the most complete libraries of Picturol film strips and Kodachrome slides.

Write for FREE catalogs. Address Dept. 2-IA.

SOCIETY FOR VISUAL EDUCATION, INC.

A Business Corporation

100 East Ohio Street — Chicago 11, Ill.

Male Call
112 OF THE GI COMIC STRIPS BY THAT NAME FEATURING THE EFFORTLESS WAR ACTIVITIES OF MISS LACE
by MILTON CANIFF
SIMON AND SCHUSTER • NEW YORK
HIGGINS
AMERICAN INDIA INK

For the best audience in the world —the best drawing ink in the world

HIGGINS

Milton Caniff, whose "Miss Lace" won the hearts of fighting men all over the world, calls the American GI "the best audience in the world."

Whatever your audience, you'll reach it best—express yourself most accurately—with the medium of master artists and draftsmen — Higgins American Drawing Inks. Higgins Inks give you control and precision right down the line — control of purpose, control of technique — assuring you unequaled facility of use.

THE INTERNATIONAL STANDARD OF EXCELLENCE

SINCE 1880

HIGGINS INK CO., INC.

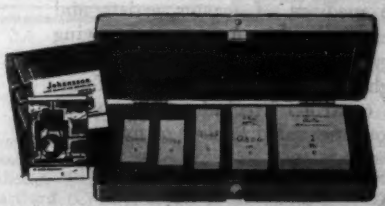
271 NINTH ST. BROOKLYN 15, N. Y.

To teach precision, teach it with "JO-BLOCKS"

Every shop student should have a chance to work with Johansson Gage Blocks. Since they are one of the "foundation stones" of precision manufacturing, no man can be said to be fully grounded in shop procedure until he knows how to use such basic tools of accuracy. No matter how limited your equipment budget may be, you can provide this vital, interesting instruction. For only $23, list price, Ford Motor Company will sell you a working set of genuine Johansson blocks, from which 31 different gages may be made up, in steps of .0625-inch, from minimum size, .0625-inch, to maximum size, 1.9375 inches. Just the thing for classroom demonstration of astonishing Jo-Block cohesion, for checking and re-setting micrometer calipers to millionth-inch accuracy, for instilling in students a comprehension of true accuracy and how it has made parts-interchangeability a reality. Write for an interesting monograph on precision measurement, entitled: "He Measured in Millionths"—also a new, profusely illustrated catalog of Johansson Gage Blocks and Accessories. You will find them quite helpful in teaching. Both are FREE, of course. Address—

FORD MOTOR COMPANY

Johansson Division Dept. 42 Dearborn, Mich.



Set No. 16-B, in handsome protective case. Consists of blocks of .0625", .125", .250", .500", and 1.000" dimensions, warranted accurate within .000008" ±. List price $23.00. (Johansson Gage Blocks are also manufactured to warranted accuracy standards of .000004" and .000002" ±).

Johansson GAGE BLOCKS

(Continued from page 36A)

to accommodate 650 students from the three towns.

♦ The B'nai B'rith Vocational Service Bureau, 1003 K St., N.W., Washington 1, D. C., has published a 38 by 42-in. two-color chart, entitled "What You Can Do With Your Navy Training as a Civilian."

This chart is a companion piece to an earlier chart, "What You Can Do With Your Army Training as a Civilian."

These charts are available as a public service to all groups rendering professional services to war veterans.

♦ To prepare top level aircraft technicians, engineers, and administrators, Northrop Aircraft, Inc., is planning the erection of two buildings and the alteration of another to fit them for instructional purposes.

The school will be known as the Northrop Aeronautical Institute, and it will offer both resident and home study courses in aeronautical engineering and airline maintenance skills.

The school is to open in the first quarter of 1946, and it will be located at Northrop Field in Hawthorne, Calif., adjacent to Los Angeles.

♦ The Senior High School at Connersville, Ind., has started to offer co-operative trade drafting courses to its students.

♦ Students, returning servicemen, teachers, and others interested in the frozen food locker industry as an occupation will find helpful information in a six-page leaflet entitled *Frozen Food Lockers*, just published by Occupational Index, Inc., New York University, New York 3, N. Y.

This is one of a series of 75 such leaflets describing opportunities in 75 different occupations. Each one covers the nature of the work, abilities and training required, earnings, entrance and advancement, and miscellaneous advantages and disadvantages.

The release of 41 new training films on precision wood machining, covering many specific subjects from the simplest skills necessary to operate a wood lathe to the complex problems faced by an experienced patternmaker, was announced recently by the U. S. Office of Education, Federal Security Agency, Washington 25, D. C.

Ten of the new films dealing with an experienced patternmaker's problems show how a patternmaker "thinks through" a particular problem — how he analyzes specifications, considers possible methods, weighs their advantages and limitations, decides upon the best method, then designs and constructs the pattern.

The films, all of which are 16mm. sound, were produced by the U. S. Office of Education by the Jam Handy Organization, Detroit; Photo and Sound, San Francisco; and R.C.M. Productions, Hollywood. Accompanying each film is a 35mm. silent filmstrip and a twelve-page teaching guide. The filmstrips are $1 each; the teaching guides are furnished without charge.

The films may be purchased from more than 250 visual education dealers or directly from Castle Films, Inc., 30 Rockefeller Plaza, New York 20, N. Y.

New Publications

Principles of Radio for Operators

By Ralph Atherton. Cloth, 344 pp., 5½ by 8¼ in., illus. Price, $3.75. The Macmillan Co., New York City.

A book which contains an exposition of the basic electrical principles which radio operators should have.

In it are given clear explanations about the various parts of the radio, and how each contributes to the proper operation of the whole.

Electronic Equipment and Accessories

By R. C. Walker. Cloth, 393 pp., 5⅜ by 8¾ in., illus. Price, $6. Chemical Publishing Co. Inc., Brooklyn, N. Y.

(Continued on next page)

ARC WELDING students advance faster when taught with... HOBART ARC WELDERS

Make arc welding easy to teach by using the welder that's most simplified in its operation—HOBART! Your students will advance faster; produce better welds easily and quickly. When you teach students with HOBARTS, they'll be ready for skilled welding jobs because it's the welder that's favored by the smallest job shop and the largest factory. Operation features, exclusive with Hobart, give the student a choice of 1000 combinations of welding heat; offers remote control at the work; provides exceptionally cool operation. Write today and get full details on the HOBART welder.

HOBART BROTHERS CO., BOX IAV-1, TROY, O.
"One of the World's Largest Builders of Arc Welders"

Reach for the Scissors

FREE! Welder's Vest Pocket Guide
☐ Full of handy welding information.
☐ Common Faults in Arc Welded Design corrects dangerous welding practices, illustrates welding symbols.

These Valuable Books Cost But Little
☐ Arc Welding Lessons. New welding text book full of valuable procedures, diagrams, charts. ..... $ .75
☐ Practical Arc Welding contains 316 pages, 512 illustrations to supplement easy to understand text, only $2.00
☐ Practical Design for Arc Welding in 3 volumes. Each volume $3.50 or all three for..... $10.00

HOBART BROS. Co., Box IAV-16, Troy, O.

Name
Address
City State

HOW TO MAKE A POOCH

GRAIN RUNS WITH TAIL
BEGIN WHITTLING AT THIS POINT
BEGIN WHITTLING AT THE TOP OF BACK LEGS AS THIS POINT WILL BE THE WIDEST FINISH WITH STAIN, PAINT ON EYES.
NOTE CURVED TAIL
BOTH SIDES WILL BE THE SAME.

HERE'S A PEACH OF A POOCH

Easy to Whittle with an X-acto

Appealing, isn't it, this little wooden figure of "man's best friend"? A cinch to make, too, with the whittler's best tool, a handy, smooth-cutting X-acto Knife! This is one of 25 clever animal projects diagrammed in detail for you in the new 32-page booklet, "Whittling Is Easy With X-acto". Send 10c for a copy . . . see how easy it is to turn out an expert job with this little wonder knife!

Always Sharp, Always Ready

Here's the whittler's delight . . . an all-metal X-acto Knife, with special assortment of whittling blades. Firm-grip handle, designed for safety and precise control. Ideal for curves and corners. Complete with wooden chest, $2. Other X-acto Knives and Sets, 50c to $5.

X-acto* KNIVES & TOOLS

Buy where you see this sign. At your Hardware, Hobby or Art Supply Shop

Or if not available, write direct to X-acto Crescent Products Co., Inc., 440 Fourth Avenue, New York 16, N. Y.

**Reg. U. S. Pat. Off.*

(Continued from previous page)

With the progress made during the war-production years, those interested in electrical engineering have much to do to keep abreast of new developments. This is especially true in the field of electronic engineering.

The 15 chapters of this book contain much information on the application of electronic devices both in and out of the field of communications for those working in the electrical designing, production, and construction fields.

How to Get a Job and Win Promotion

By C. A. Prosser and Walter F. Sahlin. Paper, 101 pp., 5⅞ by 7¾ in. Price, 50 cents. Published by McKnight & McKnight, Bloomington, Ill.

This is a revision of the previous book entitled *Getting A Job*. The new publication contains 50 additional pages and presents just the information needed to get a job and then secure promotion in it.

Guidance Implications of Visits to Business and Industry

By Earl W. Seibert, professor of psychology and director of student personnel, Green Mountain Junior College, Poultney, Vt. Three-page leaflet, 8 by 10¾ in. Price, single copies — 10 cents; ten or more copies — 5 cents each.

The conclusions arrived at during a summer school course given by the author at Temple University during the 1945 summer session.

Educational guidance, vocational guidance, vocational training, placement and follow-up were all subjects for discussion.

Occupational Briefs No. 117 to 722 incl.

Published by Science Research Associates, 228 S. Wabash Ave., Chicago 4, Ill. Each brief contains four pages, 8½ by 11 in. Price, 15 cents per brief.

The briefs mentioned in the foregoing describe the work done by the workers in the following occupations respectively: television, cannery, meat packing, motion pictures, free-lance writing, air conditioning.

Advertising As a Career

By Mark O'Dea. Paper, 137 pp., 5⅜ by 7½ in. Price, 50 cents. Published and distributed by Printers' Ink Publishing Co. Inc., 205 East 42nd St., New York 17, N. Y.

A book that is chock-full of answers to questions that might be asked by the student who wishes to discover what will be required of him as an employee in an advertising firm.

Shop Terms

By the Education Department of International Business Machines. Pocket size, 120 pages, 5½ by 8½ in. Price, $1. Published by Syracuse University Press, New York.

This book is a combination dictionary and reference book for industrial workers and office personnel. All terms are defined simply and most of the definitions are illustrated. This latter feature is especially helpful to new workers who do not know the purposes and uses of many objects which they see in the shop.

A guide to pronounciation is given in the back of this manual to assist in the pronunciation of many terms. There is also provided a complete set of tables for the calculation of feeds and speeds in milling and turning operations. A four-place table of trigonometric functions also is included.

Uranium and Atomic Power

By Jack DeMent and H. C. Dake. Cloth, 343 pp., 5⅝ by 8¼ in., illus. Price, $4. Chemical Publishing Co., Inc., 26 Court St., Brooklyn 2, N. Y.

With the widespread interest in atomic power, this book should have quite an appeal both to the layman and the scientist. It is to be hoped that the destructive effect of the atomic bomb will never again be used for the purpose for which it was first developed, but that the power contained in the atom may be harnessed to help man in a humanitarian way.

A study of the physics and chemistry of uranium, as described in this book, may do much to widen the understanding of peacetime uses for the mysterious U-235.

The Road to Community Reorganization
Doorways to Religion in Family Living
Improved Family Living Through Improved Housing

Published by The Woman's Foundation, Inc., 10 East 40th St., New York 16, N. Y.

Three reports by members of the foundation. Extra copies of the reports may be secured by writing The Woman's Foundation, Inc.

Essential Vocational Mathematics

By Claude H. Ewing and Walter W. Hart. Cloth, 266 pp., 6 by 9 in., illus. Price, $1.60. Published by D. C. Heath and Co., 285 Columbus Ave., Boston 16, Mass.

A book of practical applications of the principles of arithmetic, geometry, algebra, and trigonometry.

The authors present a large selection of problems applicable especially to difficulties encountered by workers in wood and metal. The book also contains a number of useful tables.

Safe Work Practice in Woodworking

By G. Harold Silvius and Gerald B. Baysinger. Paper, 80 pp., 5½ by 8¼ in., illus. Price, 85 cents. Published by American Technical Society, Chicago, Ill.

A book correlating safety with shopwork for woodworking students. It is tersely written, giving a maximum of instruction in a minimum of time.

Safer Home Living

Paper, 48 pp., 8¼ by 10¾ in., illus. Price, 50 cents.

Much To Do About Safety

Paper, 48 pp., 6 by 9 in., illus. Price, 50 cents.

Student Safety Activities

Paper, 44 pp., 6 by 9 in., illus. Price, 50 cents. Three manuals which should be of great serv-

(Continued on page 42A)

Shop Equipment News

New Products—Publications

DOALL LIFETIME GAUGE BLOCKS

A new gauge block has been introduced which promises to provide the following three important advantages:

1. To extend the use and application of gauge blocks.
2. To increase the wearing qualities.
3. To permit the average person to use the gauge blocks without difficulty.

These important advantages are made possible by the use of DoALLoy, a wear-resistant alloy having expansion characteristics similar to steel. Upon comparative tests, the life of this new block is 60 times that of steel blocks and 20 times the life of chrome-plated blocks.

This new gauge block of wear resistant alloy has the same coefficient of expansion as steel blocks. Heretofore, it has been impractical to use wear-resistant materials for gauge blocks, for they were only accurate at 68 deg. F., and therefore, could not be used except in a temperature-controlled room. Now these high abrasive resistant gauge blocks can be used under any temperature conditions whether in the shop, toolroom, or inspection department.

All blocks whose dimensions are .250 or smaller are of solid DoALLoy. Blocks from .300 and larger are faced with DoALLoy on their wear surfaces. This face is fused to the steel core in such a manner that it is impossible to separate them.

Lifetime DoAll gauges

The blocks are extremely acid resistant and will not discolor when subjected to many of the acids ordinarily encountered in production.

Since they are corrosion and abrasion resistant, no particular effort has to be made to keep them clean, except, of course, that when assembling them, the wringing surfaces have to be free from dust or foreign matter so as to insure the accuracy of the dimension.

For further information address The DoAll Co., 1301 Washington Ave. So., Minneapolis 4, Minn.

For brief reference use IAVE—1110.

ADAPTABLE COOLANT PUMPS

Interesting information about portable coolant systems may be obtained from the Atlas Press Co., Kalamazoo 13D, Mich.

This firm has just issued a folder on which their coolant systems are described. Various applications of these portable coolant pumps are illustrated.

Write for Atlas Coolant Pump catalog No. C. 43.

For brief reference use IAVE—1111.

THE OUTLOOK FOR NEW PRINTING EQUIPMENT

E. G. Williams, president, American Type Founders Sales Corp., announced recently that according to the present outlook, it will be possible for the firm to begin deliveries of the first C-Kellys and the *Big Chief* sheet-fed offset presses by January 1, 1946. Of course, these presses will go to holders of ATF Civilian Priority Delivery Certificates in the order of their preference. Present production schedules call for delivery of other models of both the letterpress and sheet-fed offset lines by early spring.

Deliveries by suppliers of such items as composing-room equipment, proof presses, cutters, drills, cameras, and plate-making equipment, has already started.

Every attention is also being given to the development of new products and new processes in the graphic-arts field by a staff of specially trained research engineers. The results of this research will be made available to the printing industry as fast as practicable.

For brief reference use IAVE—1112.

NEW CATALOG OF S.V.E. EDUCATIONAL PICTUROLS

A new Society for Visual Education Picturol Catalog of 813 educational film strips, many of them new or revised, and some of them just released, has been issued by the Society for Visual Education, Inc., 100 East Ohio St., Chicago 11, Ill. It is the first postwar catalog of S.V.E. film strips and includes subjects for use in practically all courses from kindergarten to college.

The film strips listed in the S.V.E. Picturol Catalog are offered without any increase in price, with most of them priced at $2 each.

For brief reference use IAVE—1113.

IDLER BACKSTANDS FOR PRODUCTION SANDING

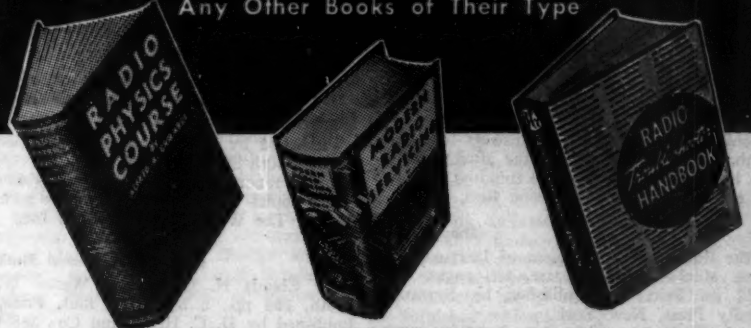
Educational release No. 2 of the current school year consists of an eight-page broadside—

(Continued on page 42A)

Ghirardi

RADIO-ELECTRONIC BOOKS

More Widely Used in Army, Navy, and Civilian Schools and Colleges, and for Home Study Than Any Other Books of Their Type



A. A. Ghirardi's 972-page RADIO PHYSICS COURSE is ideally designed for school training programs—endorsed by leading technical educators. Written specifically for beginners. Makes every step crystal clear, both in text and in 508 clear illustrations. Over 300 pages devoted to basic Electricity alone. 856 Review Questions serve as instructing guides. Price $5.

A. A. Ghirardi's MODERN RADIO SERVICING is the only complete, inexpensive 1-vol. simplified course in modern Radio repair work—from instrument fundamentals to trouble-shooting and repair of complicated equipment by the most advanced methods. Ideal basic training for all Electronic equipment servicing. 1300 pages, 706 illus., 723 review questions. Price $5.

RADIO TROUBLE-SHOOTER'S HANDBOOK by Ghirardi is a big, manual-size Case History Volume covering common trouble symptoms, their causes and remedies for almost every Radio in common use. Ideal for practical service training. Includes over 400 pages of time-saving data, charts, tables, etc. 8½" x 11" 744 pages. Price $5.

WRITE FOR FREE LITERATURE
On all Ghirardi Radio-Electronic Books
Address Dept. IA-26

The Background of Electrical Science!
***"THE SOUL OF AMBER"* by Alfred Still** will provide you and your students with hours *of pleasurable, profitable reading. The "soul" of amber is, of course, Electricity and this fascinating book follows its development from the earliest beginnings down to Faraday. Important* "background training" for electrical students. *274 pages, price $2.50.*

RADIO & TECHNICAL DIVISION, Murray Hill Books, Inc.
A subsidiary of RINEHART & CO., Inc.
232 Madison Ave., New York 16, N. Y.

SHOP BOOKS

GENERAL PLASTICS by Cherry **$1.20**

Gives detailed instructions and drawings for making, polishing and assembling 42 attractive projects. Contains list of firms that specialize in plastics.

GENERAL LEATHERCRAFT, Revised by Cherry **$1.20**

Contains 35 novel projects (many new ones) with accurate instructions with drawings for making them. Gives up-to-date list of firms that can supply materials and tools.

GENERAL SHOP METALWORK **$.60**

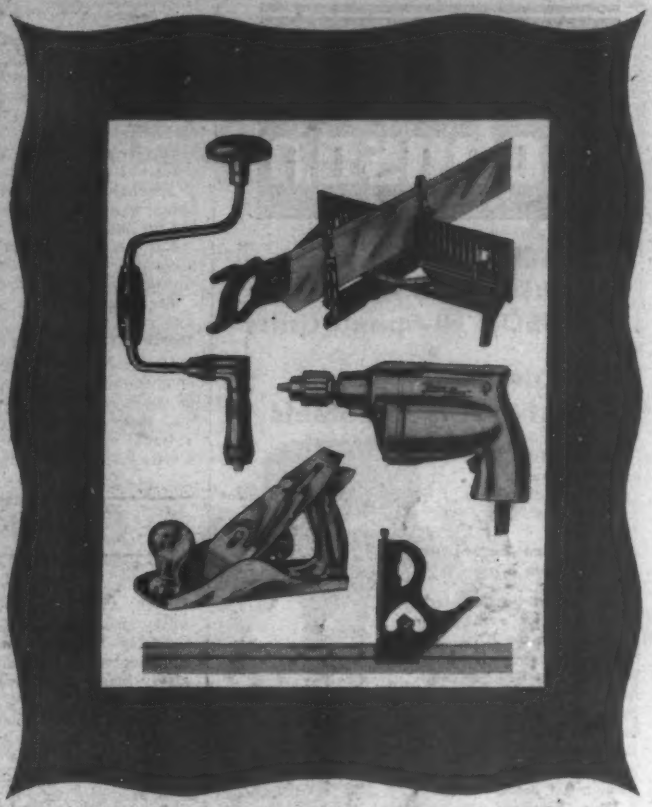
This book contains valuable information about metals, abrasives and their uses. Instruction for beginners in 4 areas of metalwork: bench, sheet, art and ornamental metal. Dragoo & Dragoo.

GENERAL BOOKBINDING, Revised by Groneman **$1.00**

A simple manual with emphasis on binding magazines and other school forms. Gives instruction for the construction of equipment. A new chapter on care of books.

McKNIGHT & McKNIGHT

BLOOMINGTON, ILLINOIS



Good Tools
INSPIRE STUDENTS

PUT YOURSELF in the student's place. Wouldn't a well-made, sharp, gleaming, well-balanced plane be much more likely to inspire your interest in handcraft?

Boys have an instinct about such things. They can *feel* the quality in a tool if it's there.

They'll feel it instantly in Millers Falls Tools, and they'll be better students from the first day of school.

There are Millers Falls hand and electric tools for almost every use. Skilled workers — and teachers have preferred them for years.

Isn't it time to give thought to your teaching equipment, and replace the battle-scarred veterans with bright, new, Millers Falls Tools? They are becoming increasingly available through your supplier.

ONE THING IN COMMON — QUALITY

MILLERS FALLS TOOLS

SINCE 1868

MILLERS FALLS CO. GREENFIELD, MASS.

Knock-Out **EXPANDING MANDRELS**

They're Fast! They're Accurate! They're Economical!

CAN BE PURCHASED SINGLY OR IN SETS

MODEL NO.	CAP.	MODEL NO.	CAP.
M0	3/8" to 1/2"	M36	1 3/32" to 1 1/16"
M1	1/2" to 11/16"	M45	1 1/16" to 2 3/32"
M2	11/16" to 1 "	M46	2 3/32" to 2 1/2"
M3	1" to 1 1/16"	M5B	2 1/2" to 3 1/4"
M4	1 1/16" to 2 1/2"	M5C	3 1/4" to 4 "
M25	11/16" to 31/32"	M55	3 1/4" to 4 3/4"
M26	31/32" to 1 "	M6B	4" to 4 3/4"
M35	1" to 1 3/32"	M6C	4 3/4" to 5 1/2"
		M7	2 1/2" to 5 1/2"

SEE YOUR NEAREST DISTRIBUTOR OR WRITE TO K. O. LEE CO. 1101 1st AVE. S. E. ABERDEEN, SO. DAK.

IF IT'S MADE BY **LEE** It's a *Knock-Out*

Quick Acting
Johnson
FURNACES

TEACH Heat-Treating at LOW COST with JOHNSON Hi-Speed Units

•

JOHNSON No. 120 Heat-Treats ALL Steels

Reaches 1500° F. in 5 Minutes
2300° F. in 30 Minutes

•

Allows More Actual Classroom Time

Teaching heat-treating technique is easier and quicker when you use the JOHNSON Hi-Speed No. 120 Furnace. No classroom time lost waiting for heating up. Compact, powerful and remarkably economical in operation. Easily regulated to harden ANY steels, dies, tools or small metal parts. Firebox 5 x 7¾ x 13½ lined with high temperature refractory. Complete with Carbofrax Hearth, G. E. Motor and Johnson Blower.

$129.50
F.O.B. Factory
Order Today!

Johnson No. 101 Bench Furnace

$13.50
F.O.B. Factory

Most powerful, efficient and economical bench furnace made for heating soldering coppers up to 12 pounds per pair . . . for heat-treating, annealing or case hardening any carbon steels. Firebox 3¾ x 4½ x 5½. Delivers up to 1800° F. without a blower. Complete, with rest block.

Send in your present Johnson Furnaces for Factory rebuilding. Write for Particulars

FREE—Johnson Furnace Catalog. Write

JOHNSON GAS APPLIANCE CO.
585 E. Avenue N.W., Cedar Rapids, Iowa
Please send me Free JOHNSON Catalog

Name .....
Address .....
City ..... State .....

Detroit Public Library

(Continued from page 40A)

"Plus Factors in Belt Grinding and Finishing With Idler Backstands."

It is an industrial sales mailing piece, but it is sent to instructors and supervisors of industrial arts and vocational education as a piece of informative literature because Idler Backstands have proved to be an important transition in the industrial usage of coated abrasives.

Through assembly with Idler Backstands, every abrasive set-up wheel — every bench grinder of ½ h.p. or more — is a potential belt sander.

For extra copies of this interesting piece of literature, address Behr-Manning Corp., Educational Department, Troy, N. Y.

For brief reference use IAVE—1114.

THREE PROMOTED IN EDUCATIONAL DEPARTMENT

Henry N. Muller, Jr., was appointed manager of graduate student training; Maynard J. Warneke, supervisor of training; and Albert J. Murphy, Jr., supervisor of student activities in the educational department of the Westinghouse Electric Corp., East Pittsburgh, Pa.

PUBLICATIONS

(Continued from page 39A)

ice to school teachers in establishing efficient safety programs.

Safety Home Living is of special interest to home-economics teachers. It contains a home safety blank which will focus the student's attention to many of the dangerous conditions commonly found in homes.

Much To Do About Safety discusses the many opportunities present for correlating safety lessons and practices with the usual school subjects and activities.

Student Safety Activities describes how to organize students for safety in the school and community, how to start these organizations, how to assign the work to the different committees, and how to publicize the various safety activities.

Essentials of General and Scientific Latin

By George W. Currie. Cloth, 118 pages, 6⅛ by 9¼ in. Price, $1.25. Chapman & Grimes, Publishers, 30 Winchester St., Boston, Mass.

A concise text which aims to teach Latin reading for specialized fields in the sciences in 12 to 18 weeks. Tests with classes have shown that high school students have been able to read Latin prose with the aid of a dictionary with no more training than that.

Fiscal and Monetary Policy

Planning Pamphlets No. 35. Price, 25 cents. National Planning Association, 800 — 21st St., N.W., Washington 6, D. C.

As We Win

Report No. 1 of the CIO Postwar Planning Committee, CIO, 718 Jackson Place N.W., Washington 6, D. C.

Progress in American Forest Management

American Forest Products Industries, Inc., 1319 Eighteenth St., N.W., Washington 6, D. C.

Oil — Product and Pillar of Freedom

Standard Oil Co. (New Jersey), Room 1626, 30 Rockefeller Plaza, New York 20, N. Y.

Rehabilitation of the Disabled Serviceman

Russell Sage Foundation, 130 East 22nd St., New York 10, N. Y.

A revised and enlarged bibliography on the subject of rehabilitation.

The Training of Vocational Counselors

War Manpower Commission, Bureau of Training, Washington, D. C.

Supplementary Trainees and War Production

Vocational Division Bulletin No. 226 — Defense Training Series No. 3. Price, 15 cents. Superintendent of Documents, Washington 25, D. C.

(Continued on page 45A)

KEY TO FABULOUS TREASURE

You who direct the creative efforts in arts and crafts, hold the key to fabulous treasure. That treasure is the happiness brought to countless people through the discovery of latent ability or a fascinating new hobby. The supplies you need are available here in a complete range and of unquestioned quality. We hope you will call on us.

Everything in Arts and Crafts

Of particular interest at the moment are these current offers:

★ **PLASTICS** — A new Plexiglas project. Desk Set of memo pad and perpetual calendar complete in kit form $1.10.

★ **TU-TONE METAL**—Heavily nickel-plated copper (20 ga.). Ideal for etched projects. Bracelet blanks and sheets available about February 1st.

★ **METAL FOILS** — For repoussé, 12" wide, 36 ga. Copper and brass 18¢ per sq. ft. Aluminum 20¢ per sq. ft.

★ **ALUMINUM MOLDS** — Durability and economy recommend these for the shop and class. No. 3190A 3¾" and 4½" only $1.62. Other sizes and prices on request.

Mail Order Address

American Handicrafts
COMPANY, INC.
45-49 ST. MARKSON ST. - EAST ORANGE, N. J.
Retail Stores at
12 East 41st Street—New York City
915 So. Grand Ave.—Los Angeles, Calif.

ESCO DRAFTING ROOM EQUIPMENT

DRAFTING BENCHES
ARTIST BOARDS
T SQUARES
TRIANGLES
SCALES
STOOLS
DRAFTING SUPPLIES
DRAFTING TABLES

ENGINEERING MANUFACTURING CO. is the pioneer manufacturer of Plastic Drafting Equipment. It has never relaxed its standard of excellence. ESCO is consistently respected and demanded. Leading dealers have ESCO on display.

PROTRACTORS
DRAWING KITS
PRECISION INSTRUMENTS
STRAIGHT EDGES
SLIDE RULES
POSTURE CHAIRS
PAPER DISPENSERS
NAVIGATING EQUIPMENT

SLIDE RULES

"Symbol of Superiority"

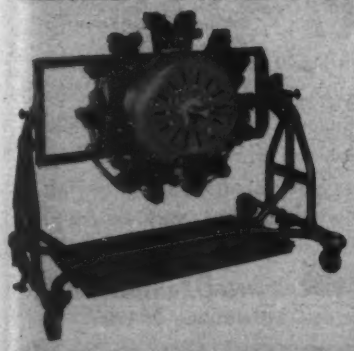
Leading dealers everywhere

METAL STOOLS CHAIRS FURNITURE

Visit our CHICAGO PRODUCTS EXHIBIT on the Avenue—Next to the Wrigley Bldg.

SHEBOYGAN **ENGINEERING MANUFACTURING CO.** WISCONSIN

AIRCRAFT ENGINE STAND AIDS INSTRUCTION



Write the Clayborne Manufacturing Company, Dept. "I," 209 South La-Salle Street, Chicago 4, Illinois, for completely illustrated Folder. See how much this Model AC-1B Engine Stand can aid in demonstrating the disassembly, assembly and overhaul of all popular makes of radial and horizontally opposed engines up to 225 H.P. No obligation.

YOU NEED THIS GREAT BOOK!

Indispensable for all Teachers and Students of Radio

Recognized and endorsed by radio experts, teachers, and all interested in radio, as one of the most practical, helpful, and authentic radio text books yet written.

J. Douglas Fortune's book is authoritative, readable, understandable! It covers everything from learning the code, on through receiver theory, the actual building of transmitters, modulator... etc. etc. right on to complete reference chapter explaining in detail most minute operations. A really indispensable book for preinduction training! Beautifully bound in cloth... over 150 pages... post-paid for only 75c... or at bookstores. Special prices on quantity purchases by teachers.

THORDARSON ELECTRIC MFG. DIV. - Maguire Industries, Inc.
500 WEST HURON STREET CHICAGO, ILLINOIS

Practical Textbooks

Examine Them on APPROVAL

These modern texts have been especially prepared for school use. You can employ them to excellent advantage in your regular program as well as your veteran training work. An examination will convince you of their suitability to your classroom needs. Any books sent for 30 days ON APPROVAL inspection subject to our educational discount if retained.

1.	What Is Vocational Education? (George Fern)	$2.50
2.	How You Can Get a Better Job (2nd Edition)	1.50
3.	Fundamental Business Law	3.00
4.	Workbook for Fundamental Business Law	1.00
5.	Safe Work Practice in Woodworking	0.85
6.	Slide Rule Simplified (without rule)	2.50
7.	Fundamentas of Radio and Workbook	2.50
8.	Fundamentals of Electricity and Workbook	2.50
9.	Diesel Electric Plants (2nd Edition)	3.75
10.	Safe Work Practice in Woodworking	1.00
11.	Aircraft Sheet Metal Blueprint Reading	2.50
12.	Aircraft Sheet Metal Work	3.75
13.	Building Insulation (2nd Edition)	3.50
14.	Plastics (enlarged 3rd edition)	4.00
15.	Electrical and Radio Dictionary	1.00
16.	How to Read Electrical Blueprints	3.00
17.	How to Remodel a House	4.75
14.	How to Plan a House	4.50
19.	Building Trades Blueprint Reading Part 1	2.00
20.	Building Trades Blueprint Reading Part 2	2.00
21.	Machine Tool Guide	7.50

(TEAR OFF HERE AND MAIL TO US)

AMERICAN TECHNICAL SOCIETY,
Drexel Ave., at 58th St., Chicago 37, Ill., Dept. HS 244.

Please send the following texts for 30 days ON APPROVAL examination. I will either return them at the end of that time or remit less your educational discount. Order by number — just circle numbers wanted.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21

Name

School

School Address

ELECTRIC POTTERY KILNS

Several temperature ranges for pottery and ceramics

1. Temperature range to 2000 F°.
2. Temperature range to 2200 F°.
3. Temperature range to 2300 F°.
4. Temperature range to 2600 F°.

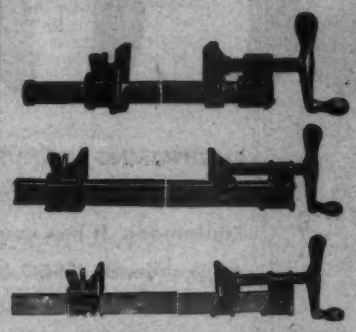
QUICK DELIVERY

Many years' experience in practical pottery, kiln building, and teaching pottery methods assures high quality and cooperation.

JAMES W. WELDON, Laboratory

2315 Harrison St., Kansas City 8, Missouri

"Jorgensen" TRADE MARK REG U S PAT OFF



CLAMPS

Our "PONY" Clamp Fixtures (to make clamps on a piece of pipe) have revolutionized the bar-clamp field by their numerous advantages. As usual, there are attempts made to produce something else "just as good" and with the usual results.

You can get the heavier and more powerful clamps in either the flat-bar or "I"-bar types, with the same principles of speed, security and economy built into them as have made the "PONY" Clamps famous. These are the genuine "JORGENSEN" Steel Bar Clamps. They cost no more than others. Write for free Catalog No. 16. Specify "JORGENSEN" or "PONY" on your orders, and see that you get the genuine to avoid disappointment.

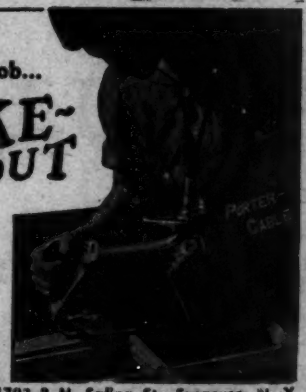
Your dealer can supply them.

ADJUSTABLE CLAMP CO.

"The Clamp Folks"

424 N. Ashland Ave. Chicago 22, Ill.

Teach Them With The SANDER They'll Use on the Job...



• Here's the sander your students will most likely use on busy production lines. It is the acknowledged leader in its field. Practical workmen prefer TAKE-ABOUT'S sustained power and high speed that assure sharper, faster cutting. They like its perfect balance that contributes to the "craftsman touch," that vital factor in expert work.

TAKE-ABOUT pays its own way on refinishing desks, table tops, blackboards and in doing other maintenance jobs. Write for details and complete list of important features.

TAKE-ABOUT

PORTER-CABLE MACHINE CO. 1702-2 N. Salina St., Syracuse, N. Y.

TURNER TESTED TORCHES ARE "TOPS"

Write Torchy Turner For Complete Details

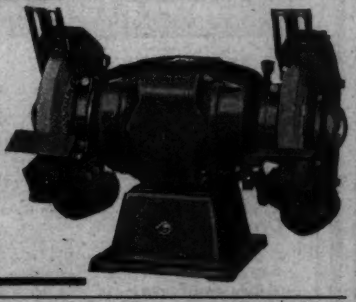
THE TURNER BRASS WORKS, SYCAMORE, ILL.

BALDOR BALL BEARING GRINDERS

The COMPLETE LINE of BALDOR Grinders (bench and pedestal types) described in BULLETIN 321. Ask for it.

— built for long, heavy-duty service

BALDOR builds a complete line of electric Grinders, bench and pedestal types — 6" to 12" wheels. At right is No. 101. 1½ h.p., ball-bearing motor; 1725 r.p.m., 220 volts. 10" x 1" Alexite wheels; adjustable toolrests and exhaust type guards..... $90.00



BALDOR ELECTRIC COMPANY
4325 Duncan Ave., St. Louis 10, Mo.

YOUR HELP, PLEASE!

The practical need for and professional popularity of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION has been on the increase. This upsurge in subscriptions while gratifying, affects YOU from the standpoint of service. To avoid missing any issues you can help by renewing your subscription promptly when notified. May we count on your cooperation?

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
Box 2068 Milwaukee 1, Wis.

LEPAGE'S GLUE

LEPAGE'S MODEL AEROPLANE GLUE

LEPAGE'S LIQUID SOLDER

MODEL AIRPLANE BOOKS

Tom's Book of Flying Models
Instruction Manual .....15¢ Postpaid

Flying Models — How to Build and Fly Them
Instruction Manual .....35¢ Postpaid

PAUL K. GUILLOW -:- Wakefield, Mass.

IF YOU TEACH
These will help

• WOODWORKING

WOODWORKING WORKBOOK—Nichols and Stiles. Acknowledged leader in its class—the most thoroughgoing, economical, fast-action workbook-textbook in the woodworking field. Information, tests, problems for beginners. Paper, 56c—5 or more only 42c ea.

GENERAL SHOP HANDBOOK—Willoughby and Chamberlain. Another famous junior-high text. Takes up practical details of every common general shop subject. Illustrated tools, procedures. Paper, 92c—5 or more only 69c ea.

ESSENTIALS OF WOODWORKING—Griffith and Cox. Without equal in simplicity, clearness, completeness of coverage for a standard course in hand woodworking. Prepared by one of the great teachers in school-shop history. Revised in the 1930's by George Cox of Oregon State. Cloth $1.68—5 or more, only $1.28 ea.

• METALWORKING

BASIC BENCH-METAL PRACTICE—Giachino and Feirer. More unsolicited letters of praise for this modern, illustrated text on equipment, tools, supplies, materials, procedures in basic metal-work have come from schoolmen of all ranks than for any other book we have published in the metals field. Tough paper, reinforced $1.84—5 or more, only $1.38 ea.

SHEET-METAL PATTERN DRAFTING—Daugherty. In a class by itself. All 114 problems, typical of trade practice. Illustrated with photo of finished form, developments, step-by-step instructions. Paper, $1.76—5 or more, only $1.32 ea.

• DRAWING

BEGINNING MECHANICAL DRAWING—Roberts. Organized on the information-unit, job-unit plan—only book on drafting so designed. Modern style, every unit clearly marked, easily followed. Second large printing since revision. Cloth, $1.80, paper $1.12—5 or more copies only 84c ea.

BEGINNING PROBLEMS IN MECHANICAL DRAWING—Bennett. Pa. cr. 56c—5 or more only 42c ea.

• PRINTING

THE PRACTICE OF PRINTING—Polk. World-famous printing text, a little better than ever despite every handicap. Carefully developed in every detail for training at the high-school level, with high-school equipment. No serious printing student should be without a copy. Cloth $2.25—5 or more copies only $1.69 ea.

THE MANUAL ARTS PRESS
165 Durac Bldg. Peoria 3, Ill.

THE METAL CRAFTS

need not be completely eliminated from your school program. We can still supply some tools, supplies, and materials

Our catalog IA sent to teachers of Industrial Arts who specify school connection.

METAL CRAFTS SUPPLY CO.
10 Thomas Street Providence, R. I.

(Continued from page 42A)

The Mahogany Book
Mahogany Association, Inc., 75 E. Wacker Drive, Chicago, Ill.

Retraining War Workers
By Committee on Education, Chamber of Commerce of the United States, Washington, D. C.

25 Jigsaw Projects
Science and Mechanics, 154 East Erie St., Chicago 11, Ill. Price, 25 cents.

An Enlarged Program of Vocational Education
By Committee on Research and Publications, The American Vocational Association, Inc., Washington, D. C. Price, 40 cents.

ATTENTION, G.I. JOE

A model machine shop suitable for one-man operation which can be housed in the back of a store, a two-car garage, or even in a basement, is being exhibited by The DoAll Company, of Des Plaines, Ill., and Minneapolis, Minn., at the DoAll plant, 264 North Laurel Ave., Des Plaines, Ill.

It has been specially designed to assist veterans with mechanical skills who desire to go into business for themselves.

The equipment of this streamlined machine shop includes (1) a contour sawing machine; (2) supply cabinet; (3) drill press; (4) tool cabinet; (5) lathe; (6) arbor press; (7) bench drill press; (8) toolmaker's bench; (9) vise; (10) bench plate; (11) tool grinder; (12) anvil; (13) electric arc welder; (14) oxyacetylene welder; (15) rough bench; (16) vise; and (17) stock storage rack

Although the various types of shops are designed primarily for repair and service work in any of the thousands of communities scattered from coast to coast, ambitious operators may readily expand into small specialty parts manufacturing, and from this point, they may follow logical expansion into large modern industries producing industrial and consumer goods.

A training program is offered at the DoAll Technical Institute which provides the specific layouts for the various shops, lists the machines, tools, and equipment required to begin operation, gives information concerning costs and methods of financing, and, in general, covers the entire prospects of the industry.

A 64-page booklet, "Make Money With Your Own Shop," describes the entire program. Its purpose is primarily inspirational, and may be obtained free of charge by veterans interested in owning and operating their own businesses, by writing to The DoAll Company, Minneapolis, Minn.

Leading Vocational Textbooks Selected from the VAN NOSTRAND LIST

Commercial Art of Show Card Lettering

by James Eisenberg, chairman Art Department, Bok Vocational High School, Philadelphia, Pa.

This sound exposition of the art and technique of free-hand brush lettering was written by a teacher who understands students' needs. It is basic, but complete—a highly informative manual of lasting value to students of show card lettering, printing, advertising, layout, and allied fields. Illustrated. 147 pp. $2.75

Bishop, C. C.
ALTERNATING CURRENTS FOR TECHNICAL STUDENTS. *Ill. 424 pp.* $2.50

Heitner J., Shidle, N. G. and Bissell, T. A.
ELEMENTS OF AUTOMOTIVE MECHANICS. *Ill. 395 pp.* $1.92

McMackin, F. J. and Shaver, J. H.
THE MATHEMATICS OF THE SHOPS *Ill. 444 pp.* $2.50

Sacks, R. J.
THEORY AND PRACTICE OF ARC WELDING. *Ill. 383. pp.* $2.80

Lockrey, A. J.
PLASTICS IN THE SCHOOL AND HOME WORKSHOP. *2nd. Ed. Ill. 233 pp.* $2.50

Svensen, C. L.
MACHINE DRAWING. *3rd. Ed. Ill. 280 pp.* $2.50

Peck, O.
JEWELRY AND ENAMELING *377 pp.* $2.50

Sweopes
LESSONS IN PRACTICAL ELECTRICITY. New Edition ready 1946.

From the Henry Ford Apprentice and Trade-school Series:

Nadon, J. M. and Gelmine, B. J.
INDUSTRIAL ELECTRICITY *Ill. 607 pp.* $3.00

Wagener, A. M. and Arthur, H. R.
MACHINE SHOP: THEORY AND PRACTICE *Ill. 306 pp.* $2.28 (cloth) $1.60 (paper)

Wagener, A. M. and Arthur, H. R.
WORKBOOK ON MACHINE SHOP THEORY AND PRACTICE *Ill. 188 pp.* $1.00 (paper)

Wagener, A. M. and Arthur, H. R.
MACHINIST'S AND DRAFTMAN'S HANDBOOK *Ill. 804 pp.* $4.50

Nicholson, F. and Jones, F.
BLUEPRINT READING: UNDERSTANDING SHOP PRACTICES *Ill. 141 pp.* $2.00

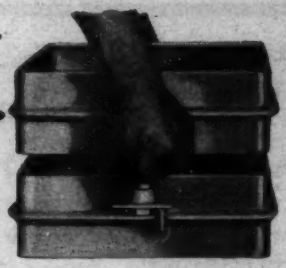
Paull, J. H.
INDUSTRIAL SHEET METAL DRAWING *Ill. 153 pp.* $1.50

Paull, J. H. and Sgro, C. E.
APPLIED MECHANICAL DRAWING *Ill. 204 pp.* $1.50

Examination copies will be sent on request, and all delegates to the American Vocational Association convention are cordially invited to see these and other important books at the Van Nostrand booth, number 56.

D. Van Nostrand Co., Inc.
250 Fourth Avenue New York 3, N. Y.

Style "S" Sterling Flask



STERLING STEEL FLASKS

for Strength and Rigidity!

All-steel, all-welded, with high carbon content, Sterling Flasks combine maximum strength with minimum weight. Solid center rib and solid sand flanges at top and bottom. Full width bearing. Combination pin lugs and handles simplify handling and speed up the molding job.

Write for new Catalog No. 56.

A 4843-R

"HOLD-HEET" GLUE POTS

ARE STANDARD IN SCHOOL SHOPS!

They're safe, fool-proof, built "like a boiler" to take plenty of shop abuse. Automatic Thermostat controls glue temperature; no burned or spoiled glue; no water jacket troubles; no fire hazard. PLAY SAFE —teach students modern, safe gluing methods with this superior "Hold-Heet" Electric Glue Pot — used by industry and schools everywhere!

1 qt. $14 4 qt. $24
2 qt. $17 8 qt. $36
115 or 230 Volts

RUSSELL ELECTRIC COMPANY
364 W. Huron St., Chicago 10, Ill.

LUMBER
FOR SCHOOL SHOPS

Our 50 years of experience in marketing lumber is your assurance of a service hard to duplicate. 65% of our lumber is under shed. Send us your requirements. We will try to supply you what is still available.

The Tegge Lumber Co.
3500 W. Bruce St. Milwaukee, Wis.

OUR 27th YEAR

Always a complete stock of Lacings, Linings, Tools, Patterns, Instruction Books, Projects, Lucite Kits, etc. LEATHER is now scarce but we are doing our best to keep in stock largest possible collection of different types of leather permissable under present restrictions.

OSBORN BROTHERS
223 W. Jackson Blvd. Chicago 6, Ill.

PAXTON

Oldest Name in the Field

INDUSTRIAL ARTS

Lumber & Plywood

FRANK PAXTON LUMBER CO.

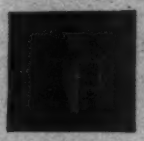
Des Moines Denver
Fort Worth Kansas City

Catalog free to instructors

Heat Treating Furnaces and Equipment

FORGES—gas fired, no smoke or dirt. Sizes from the bench type at right to large floor models.

MELTERS—for aluminum, brass, lead, gold, etc., many sizes and types.



We also supply Ovens, Salt Baths, Complete Shop Tables — Blowpipes, Burners Etc.

American Gas Furnace Co.
Elizabeth, N. J.

SHAPER & SASH
CUTTERS

Send for catalogue. Showing shaper cutters, band saws, circular saws boring bits, plug cutters, sash cutters, cabinet cutters, etc.

WM. M. KNOUREK
WOODWORKERS TOOL WORKS

222 S. Jefferson St. Chicago 6, Ill.

Materials for Brush Making

Brush Fibres, Tampico, Fibre Mixtures, Sterilized Horse Hair. Hair, Bristle and Tampico mixtures solid or taper stock, original lengths cut to size. *Samples matched.*

E. B. & A. C. WHITING CO.
Burlington, Vermont

LUMBER FOR SCHOOLS

T. A. FOLEY LUMBER CO.
PARIS, ILL.

LOOMS, Table and Foot
Reed, Raphia, Handicraft Supplies

Send for catalog

J. L. HAMMETT CO.
CAMBRIDGE, MASS.

BOWS and ARROWS

The all around good shop project that is useful, educational and entertaining. The FLAT BOW book shows how 75c; excellent flat lemonwood staves $12.00 dz.; tips, nocks, ground base feathers, good cedar shafts for 100 arrows $15.25.

Indianhead Archery Mfg. Co.
Box 303—IA Lima, Ohio

No waiting, extra prompt delivery. FOLDER FREE

STA-WARM TRIPLEX

3 Heat Glue Pot

A low cost, high efficiency quality Electric Glue Pot with 3 heating control —

1. Low—for intermittent use.
2. Med.—for continuous use.
3. High—for quick heating.

Write for details on its 17 advantages.

1 pt. - $6.75
1 qt. - 7.25
2 qt. - 9.25

Details also available on other Sta-Warms, 1 pt. to 8 qt., with automatic control.

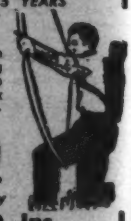
STA-WARM ELECTRIC CO., Ravenna, Ohio
Rep. by Oliver Machy. Co., Gr. Rapids, Mich.

Bow and Arrow Supplies

QUALITY LEADERS FOR 15 YEARS

Shop Special

A semi-finished Archery Set with a 5' 0" Lemonwood bow pulling about 40 pounds plus a hemp string, prepared materials for six arrows, and diagramed instructions. Sells retail for $3.50.



Complete Set Bow—6 Arrows $2.49

Semi-Finished Schools Only

L. C. WHIFFEN CO. Inc.
622 W. Wisconsin Ave., Milwaukee 3, Wis.

Electro-Typers

Especially qualified to be of service to the school printshop.

Promptness and quality assured.

Forms returned same day received.

Badger - American Electrotype Co.
600 Montgomery Bldg.
407 East Michigan St., Milwaukee, Wis.

WOODWORKING TOOLS
CABINET HARDWARE
and SUPPLIES

Send for Catalog K. Prompt Service
Indicate your priority number on all orders.

LUSSKY, WHITE AND COOLIDGE, INC.
216 W. Monroe St. Dept. C11 CHICAGO 6, ILL.

UNIVERSAL ELECTRICIANS TOOLS

Visegrips, CorTes, waterpump, needlenose, diagonal cutter pliers, crescent wrench, pipe-wrench, plastic screwdriver, clawhammer, hacksaw and 14 pc. socket set 7/16 to 1" including Universal joint and flex handle. Complete 25 piece guaranteed tool kit only $49.85. Immediate shipment! Catalogue and price list free! Order now!

UNIVERSAL TOOL COMPANY
1927 Grand Ave. IAV Kansas City, Mo.

ELECTRIC
MOTOR
PARTS
FOR ALL MAKES

ALSO ALL MATERIALS AND TOOLS USED IN THE MOTOR REPAIR SHOP

Free Catalogue to Instructors

READING ELECTRIC CO., Inc.
200 William St., New York

The first small portable tool and today's finest for work on metal, alloy, plastic, wood, horn, bone, glass, etc. Fits student's hand comfortably, perfectly balanced, weighs only 12 oz. Handee's usefulness is as extensive as the number of quick and easy-to-change accessories you have . . . choose from more than 300 in the Chicago line. AC or DC. 25,000 r.p.m. With 7 accessories, postpaid $18.50

COMPACT SCHOOL SET
Get this set first, then add accessories as needed. Strong case contains a DeLuxe model Handee and 45 of the most practical accessories. Postpaid, $25.00.

Write for new 64-page catalog

CHICAGO WHEEL & MFG. CO.
1101 W. Monroe St.
Dept. IA, Chicago 7, Ill.

TOOLS ALWAYS SHARP with PLURALITY OILSTONE TOOL GRINDERS

Now available in 3 sizes
No. 425 Plurality Sub Jr.
No. 450 Plurality Jr.
No. 475 Plurality

No. 450 Plurality Jr.

Grinding can be done on a cone, coarse or fine oilstone, leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

Mummert-Dixon Co. Hanover, Pa.
Originators and Pioneer Manufacturers of Oilstone Tool Grinders

1946 CRAFT CATALOG

Will be off the press shortly! Those of you who requested the 1945 edition after it went out of print will be mailed the new, enlarged Handcraft Handbook No. 46 as soon as possible. We regret the delay but the demand was unprecedented.

Elcraft 147 COURT PLACE "EVERYTHING FOR HANDICRAFTS"

Guide to Products and Services

Advertisers in this index are given a code number in addition to the page number on which the advertisement appears. Refer to the advertisement for product or services available. Write direct to advertiser or use the coupon in requesting information from a number of advertisers.

Code No.		Page No.
20	Adjustable Clamp Company	44A
21	Air Reduction Sales Co.	25A
22	American Gas Furnace	46A
23	American Handicrafts Co.	42A
24	American Technical Society	43A
25	American Type Founders Sales Corp.	27A
26	Armstrong Bros. Tool Co.	6A
27	Atkins and Company, E. C.	48A
28	Atlas Press Company, The	13A
29	Badger-American Electrotype Co.	46A
210	Baldor Electric Company	44A
211	Black & Decker Mfg. Company	5A
212	Brodhead-Garrett Co.	35A
213	Bruce Publishing Company, The	3rd Cover
214	Burrill Saw & Tool Works	16A
215	Carborundum Company, The	15A
216	Carmen-Bronson Company	30A
217	Carter Div., R. L.	16A
218	Chicago Flexible Shaft Co.	6A
219	Chicago Wheel & Mfg. Company	47A
220	Cincinnati Tool Company, The	11A
221	Clayborne Manufacturing Co.	43A
222	Columbian Vise & Mfg. Co.	4A
223	Delta Mfg. Company	Insert bet. 8A & 11A
224	De Walt Products Corp.	17A
225	Dick Company, A. B.	3A
226	Dixon Crucible Co., Joseph	32A
227	Douglas Fir Plywood Assoc.	33A
228	Elcraft Div.	47A
229	Engineering Manufacturing Company	43A
230	Fellowcrafters, Inc.	36A
231	Floquil Products, Inc.	16A
232	Foley Lumber Company, T. A.	46A
233	Foley Manufacturing Company	14A
234	Ford Motor Co.	38A
235	Guillow, Paul K.	44A
236	Hammett Company, J. L.	46A
237	Heller Brothers Company	26A
238	Higgins Ink Co., Inc.	37A
239	Hobart Brothers Company	38A
240	Indianhead Archery & Mfg. Co.	46A
241	Johnson Gas Appliance Co.	42A
242	Kearney & Trecker Corp.	7A
243	Kester Solder Company	4A
244	LeBlond Machine Tool Co., R. K.	4th Cover
245	Lee Company, K. O.	41A
246	LePage's, Inc.	44A
247	Lewis Machine Tool Co.	48A
248	Lufkin Rule Co., The	4A
249	Lussky, White and Coolidge	46A
250	Macmillan Company, The	29A
251	Manual Arts Press	45A
252	McGraw-Hill Book Co., Inc.	30A
253	McKnight and McKnight	41A
254	Metal Crafts Supply Co.	45A
255	Millers Falls Company	41A
256	Morgan Vise Company	8A
257	Mummert-Dixon Company	47A
258	Murray Hill Books, Inc.	40A
259	Nicholson File Company	18A
260	Ohlen Bishop Mfg. Company	14A
261	Oliver Machinery Co.	6A
262	O'Neil-Irwin Mfg. Company	12A
263	Osborn Bros.	46A
264	Paxton Lumber Co., Frank	46A
265	Pittsburgh Plate Glass Co.	2nd Cover
266	Porter-Cable Machine Co.	44A
267	Reading Electric Company, Inc.	46A
268	Ruby Chemical Company	12A
269	Russell Electric Company	46A
270	Schweizer Aircraft Corporation	2A
271	Sheldon & Co., E. H.	28A
272	Sheldon Machine Co., Inc.	34A
273	Skilsaw, Inc.	14A
274	Snap-On Tools, Inc.	12A
275	Society for Visual Education	37A
276	South Bend Lathe Works	1A
277	Standard Electric Time Co.	24A
278	Stanley Electric Tool Div.	8A
279	Stanley Tools	2A
280	Star Paper Fastener Co.	48A
281	Starrett Co., L. S.	31A
282	Sta-Warm Electric Company	46A
283	Sterling Wheelbarrow Co.	46A
284	Tegge Lumber Co., The	46A
285	Thordarson Elec. Mfg. Co.	43A
286	Turner Brass Works, The	44A
287	United States Plywood Corp.	11A
288	Universal Tool Company	46A
289	University of Minnesota	30A
290	Van Nostrand Company, D.	45A
291	Victor Animatograph Corp.	21A
292	Walker-Turner Co., Inc.	23A
293	Wallace Company, J. D.	2A
294	Weber Company, F.	11A
295	Weldon Laboratory, James W.	44A
296	Whiffen Co., Inc., L. C.	46A
297	Whiting Company, E. B. & A. C.	46A
298	Woodworkers' Tool Works	8A & 46A
299	X-Acto Crescent Products Co., Inc.	39A
2100	Yates-American Machine Company	20A

USE THIS COUPON

The advertisements in this issue have been given a code number for your convenience in requesting information on products, services, booklets, and catalogs offered. Encircle the code number of the advertisement in which you are interested, clip and mail the coupon to INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Your request will receive prompt attention. BRUCE—MILWAUKEE.

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION
540 North Milwaukee St., Milwaukee 1, Wis.

Please send information offered in the advertisements we have encircled.

20	21	22	23	24	25	26	27	28	29	210	211
212	213	214	215	216	217	218	219	220	221	222	223
224	225	226	227	228	229	230	231	232	233	234	235
236	237	238	239	240	241	242	243	244	245	246	247
248	249	250	251	252	253	254	255	256	257	258	259
260	261	262	263	264	265	266	267	268	269	270	271
272	273	274	275	276	277	278	279	280	281	282	283
284	285	286	287	288	289	290	291	292	293	294	295
296	297	298	299	2100							

Also information on .....

Name .....
Please Print

Title ..... **School** .....

City ..... **State** .....

Detroit Public Library

ATKINS

Easy TO LEARN WITH A Pleasure TO TEACH WITH

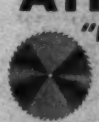
The popular Atkins "2000" Hand Saw, one of a complete line of "Silver Steel" Saws.

Pupils and instructors alike find in Atkins "Silver Steel" Saws more qualities that lead to faster craft mastery. The student who works with an Atkins takes to its perfect balance, its keen-cutting ease of handling. The instructor who teaches with Atkins Saws appreciates their ruggedness and edge-holding ability. Moreover, Atkins "Silver Steel" Saws are right for even the most limited school budgets because they are ruggedly made to stand up under constant classroom use. These "Silver Steel" advantages are worth looking into now. Plan to have them in your school shop by requisitioning "Atkins" next time you order saws.

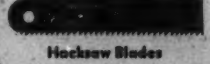
E. C. ATKINS AND COMPANY
404 S. Illinois St., Indianapolis 9, Ind.
Agents and Dealers in all Principal Cities the World Over

Atkins WALL CHART ON SAW FITTING!
A practical visual aid, showing the correct way to file and set saw teeth, together with detailed instructions. Overall chart measures 19" x 25". Write for your free copy today!

ATKINS Silver Steel SAWS
"For Every Classroom Use"


Circular Saws

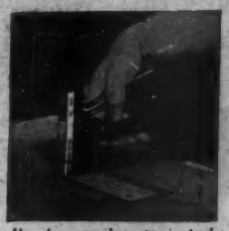
Handsaws


Hacksaw Blades

Narrow Band Saws

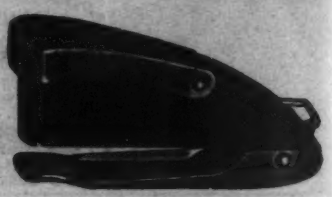
AAA ATKINS

Instructors . . . Learn The Advantages of these STAR Tools


Use inexpensive staples Tacks List Price, $8.00

STAR AUTOMATIC TACKERS
The Best Way to Tack Things

Used in industrial production work. Tack upholstery, wire screens, shades on rollers, dozens of other uses. Easy to operate — just squeeze the handle. Hold material in place with one hand, tack it with the other. Tack within 1/16" of an edge and in close quarters where you can't swing a hammer.


List Price, $2.90

STAR
Model S122P Stapler

A stapler and light tacker combined. Handy — fits in pocket. Squeeze it to staple papers — Holds 105 Standard Staples.

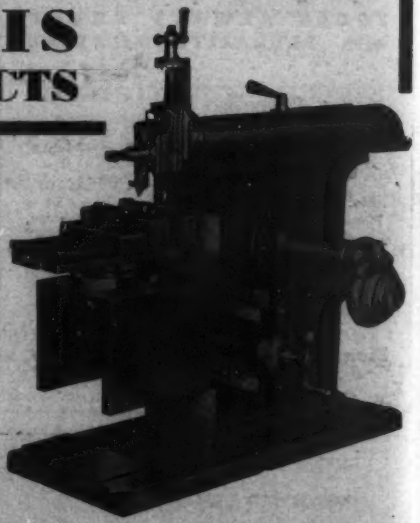
Keep one in the corner of your desk drawer for fastening lesson papers, correspondence and other related papers together.

Swing the base down and around and it becomes a light duty tacker. Fine for tacking up charts, pictures and papers on walls, drawings on drawing boards.

Send for catalog of the Star line of tackers and paper fasteners.

★ Star Paper Fastener Co.
NORWALK Dept. AE CONNECTICUT

For sounder *initial* training use
LEWIS PROJECTS



The skillful machinists of tomorrow are receiving their initial training today with Lewis Projects. Developed to give sound training in machine tool fundamentals and accuracy in workmanship, they are furnished in rough or semi-finished castings with necessary assembly blueprints. Completion and assembly enable schools to equip their shops economically and give students the "know how" of machine tool construction and operation.

Lewis Projects are available in shapers, mills, jointers, circular and band saws, etc., at extremely low prices. Savings are as high as 80% of usual costs of comparable finished tools.

Write today for further information on the Lewis Shop Projects. Ask for the illustrated catalog—sent free.

Lewis MACHINE TOOL CO.
P. O. Box 116, Station A, Dept. X-59, Los Angeles 31, California

The most important teaching aid yet devised . . .

TEACHING WITH FILMS

by George H. Fern: Vice President, Industrial Education, American Vocational Association; formerly director, Michigan State Board of Control for Vocational Education and Eldon B. Robbins: formerly Supervisor, Audio-Visual Aids, Michigan State Board of Control for Vocational Education.

WITH SPECIAL APPLICATIONS TO INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

Now—in one volume—all the practical information relative to the effective use of teaching films, with special application to the needs of shop teachers.
Written by experts in the fields of vocational education and audio-visual aids this new publication will help every one interested in teaching with films keep abreast of this *most significant* single development in modern education.

KEY TO WEAVING

by Mary E Black, Director, Handicrafts and Home Industries, Province of Nova Scotia, Canada

A complete "play-by-play" description of the processes involved in weaving presented in the simplest manner possible. Very inclusive.

NEW ESSENTIALS OF UPHOLSTERY

by Herbert Bast, Upholstery Instructor, Vocational School, Sheboygan, Wisconsin

A *completely* revised, *up-to-date* edition of the author's former book entitled Essentials of Upholstery.

Inquire about these popular titles . . .

DRAWING FOR LIFE AND INDUSTRY

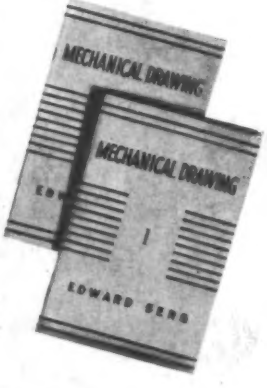
by Daniel Green, The Stout Institute, Menomonie, Wisconsin

Here is a new and more vitalizing approach to the teaching of drawing. It makes greater application to situations in ordinary walks of life. Excellently organized in terms of well graded projects.

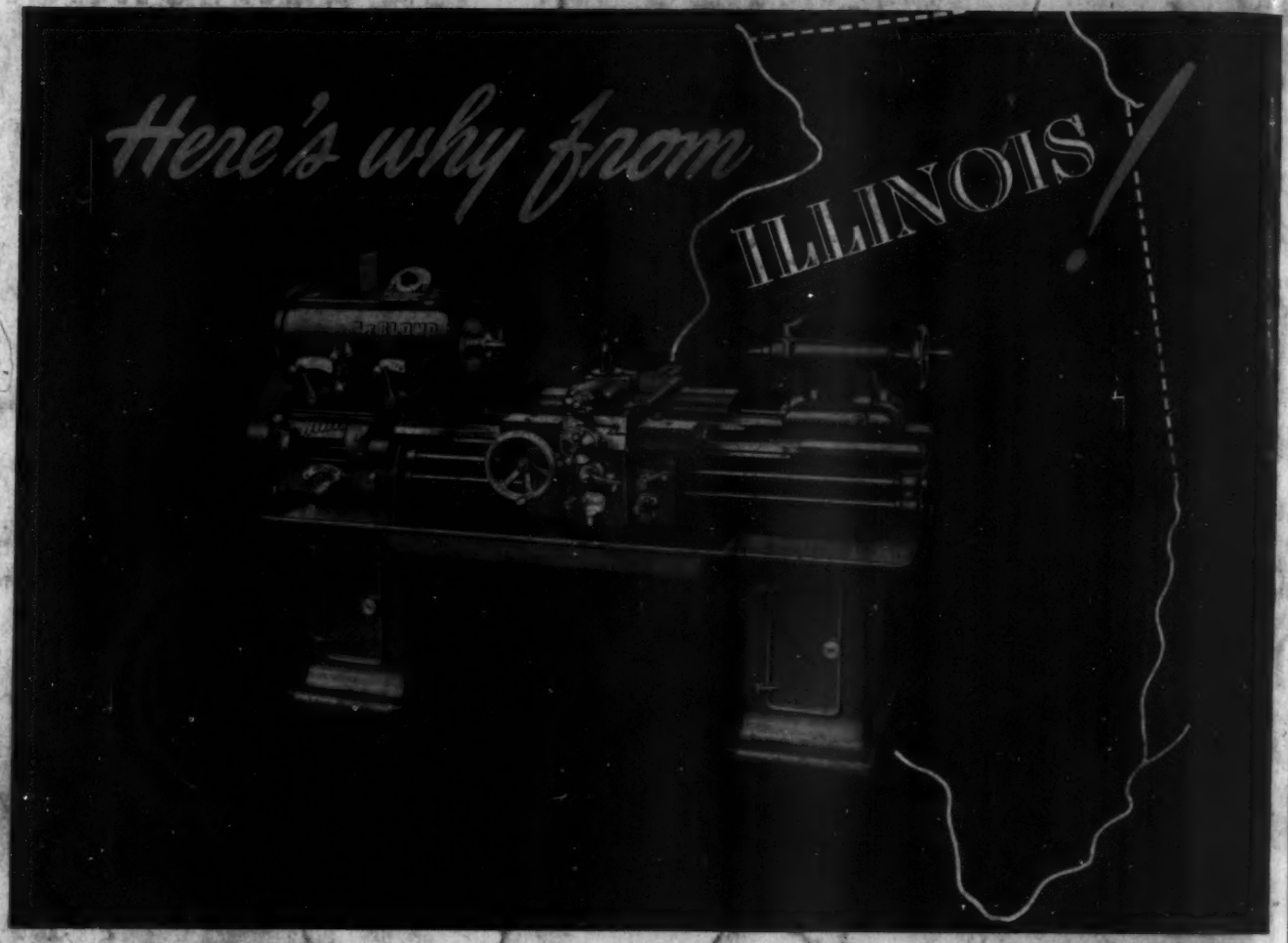
MECHANICAL DRAWING
Books I and II

by Edward Berg; Group Chairman, Industrial Arts Department, Washington High School Milwaukee, Wis.

A separate book for first and second year high school. Gives you the latest practical requirements of industry. Features improved methods of presenting the subject methods of presenting the subject. size.



Come to our booth for a friendly visit and present your teaching problems. We have a comprehensive list of publications covering practically every major area in the field of Industrial Arts and Vocational Education.



Many are the reasons why LeBlond Lathes are preferred in school shops. Here are some from an instructor in Illinois.

We quote from a letter received by one of our branch offices:

"As you probably know, we have in our machine shop twelve 13" Regal Lathes and four 17" Regals. All of these have been used throughout the war for war training. We have trained about 3000 war workers, as well as our own vocational students. These lathes have had a most severe workout. Of the lathes that are not Regals, many cost two or three times more. I believe that were I again to set up a school shop, I would choose Regals.

"I think that elimination of many places to oil with the pump on the carriage is alone reason enough to select Regal Lathes. On another make the same size we have about 30 places to oil with a can—and they require three different oils and one grease." **(Writer's name supplied on request.)**

That's added proof of LeBlond dependability and superior performance — proof by a man whose experience qualifies him to furnish it.

Can your shop afford to be equipped with anything less than LeBlond Super Regal Trainers?

WRITE FOR FULL DETAILS AND SPECIFICATIONS

SINCE 1887 THE WORLD HAS BEEN TURNING TO LEBLOND FOR TURNING EQUIPMENT

THE R. K. Le BLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO, U. S. A.

NEW YORK 6, Singer Bldg., 149 Broadway, WOrth 2-0722; CHICAGO 6, 20 North Wacker Drive, STA 5561

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES